Alcohol use in special populations in Africa

Data from the World Health Survey and Study on global AGEing and adult health

Priscilla Martinez

SERAF
Norwegian Centre for Addiction Research
Institute of Clinical Medicine
Faculty of Medicine
University of Oslo,
Oslo, Norway
2012

Norwegian Centre for Addiction Research

UiO : University of Oslo

© Priscilla Martinez, 2013

Series of dissertations submitted to the
Faculty of Medicine, University of Oslo
No. 1516

ISBN 978-82-8264-571-3

All rights reserved. No part of this publication may be
reproduced or transmitted, in any form or by any means, without permission.

Cover: Inger Sandved Anfinsen.
Printed in Norway: AIT Oslo AS.

Produced in co-operation with Akademika publishing.
The thesis is produced by Akademika publishing merely in connection with the thesis defence. Kindly direct all inquiries regarding the thesis to the copyright holder or the unit which grants the doctorate.

To Juliann and Sharon

For more than a century, Africa's fate was more often than not decided by people beyond its shores. But not anymore. The future of the emerging countries is in the hands of their own people.

—Ellen Johnson Sirleaf, President, Republic of Liberia
"Introduction" to *Emerging Africa: How 17 countries are leading the way* by Steven Radelet
Washington, DC: Center for Global Development, 2010;5.

If epidemics are that which befall the people, it is our professional obligation to do the best work we can, with the clearest thinking possible, to identify what will allow the people to stand once again. Our commitment to the people's health – and to explaining the people's health – demands no less.

—Nancy Krieger, PhD.
Epidemiology and the People's Health
New York: Oxford University Press, 2011;295.

How are you going to get this case of wine from your car into your house? —store clerk.
One bottle at a time.

—Priscilla E. Martinez, 89 years old
Sacramento, CA, 2012.

Table of Contents

Acknowledgements

Saying that I want to “acknowledge” the many people who helped make this work possible – the process meaningful, the outcome worthwhile – falls short of the praise they deserve and the gratitude I feel, but such is academic terminology. What I would rather call this section is “A brief overview of some of The Most Awesome People Ever I want to carry on my shoulders and parade around town while fireworks explode and bands play”. Next time.

First and foremost, my Supervisors: Dr. Thomas Clausen, Dr. Lars Lien and Dr. Anne Landheim. Thank you Thank you Thank you, for teaching me the nitty gritty of being a researcher, from distilling research aims to grant writing to publishing papers; for understanding my errors and praising my accomplishments, giving sage career advice, and letting me barge into your offices or call you pretty much whenever I wanted. Thank you for deftly guiding me into the world of academia.

To my co-authors: the incomparable mathematician Dr. Jo Røislien, for teaching me to be true to the science, and mostly for saying you would point at me and laugh if I didn’t brave the world of R; Nirmala Naidoo at WHO, for handling my endless dataset questions; to Dr. Paul Kowal at the University of Newcastle, for excellent revisions and kind, helpful comments; to the organizers and staff of the World Health and SAGE Surveys, and the WHO for making their important data public.

To my SERAF Research Director: Dr. Jørgen Bramness. Thank you for taking on a loud-laughing American as a stipendiat, for supporting the changes in my work, and for enthusiastically believing in my varied research ideas and ambitions.

To *everyone* at SERAF: I am thrilled I was able to be a part of the excellent social and professional environment at SERAF. Whether technically, substantively, personally, or all of the above, each of you has helped me through this process and I am effusively grateful.

To my longtime mentor and friend, Dr. David R. Bangsberg, for getting me into this crazy research business in the first place.

To my Norwegian family: Ann-Liz Johansen Grønli, Silje Viste Grønli, Claire Bant, Katinka Anchersen Feiring, Greg Reckless, Ly Vuong and the rest of you (don’t trip, you know who you are). This experience would have been lonely and miserable without you, and misery rarely produces functional doctorates. I’m also going to set off fireworks for the selfless Anchersen-Feiring family, for giving me shelter, food, support and kos these last months.

To my Mexican-American family: The Martinez’s (David!), Martinez- Johnson’s, McKenna’s (Nene!), Guerra-Harris’s, and the steadfast friends of old. Thank you for supporting me from a great distance all along the winding way, and for welcoming me home in the end. Horale!

Abstract

Background

Alcohol use is an important factor in a population's risk for disease and mortality. Alcohol has a long history of use in Africa, and changes in drinking behavior are underway in many African states. Women and older adults are two special populations that comprise sizable proportions of the general population and whose use of alcohol will have important consequences for public health in Africa. There is limited information about the drinking behavior of women and older adults, what factors are associated with different drinking patterns and how these populations compare to one another across African nations. Such information is necessary for the development of effective public health policies and for advancing our understanding alcohol epidemiology in Africa.

Aims

We aimed to determine the prevalence of various types of drinking patterns, correlates of these patterns and cross-national similarities and differences of both drinking patterns and associated correlates among African women and older adults.

Methods

This work is a secondary analysis of publicly available data from the World Health Organization. We used material from two nationally representative population-based surveys, the World Health Survey (WHS) and the Study on global AGEing and adult health (SAGE). The WHS was conducted in 20 African countries and SAGE in Ghana and South Africa. Both surveys collected data through face-to-face interviews using standardized instruments on alcohol use and a variety of measures of socio-demographics, health behaviors and well-being. We constructed alcohol measures based on self-reported use over the previous week.

Results

A total of 40,739 African women were included in the WHS, and 4289 adults aged 50 and above in Ghana and 3666 in South Africa in the SAGE Survey. Overall, lifetime abstention rates ranged from 56% in Mauritius to 99% in Comoros among women. Among older adults,

lifetime abstention was 42% in Ghana and 75% in South Africa. Among currently drinking women, rates of risky single-occasion drinking varied from 0.5% to 58% in Mauritius and Chad, respectively. Among current drinking older adults, at risk drinkers comprised 26% in Ghana and 37% in South Africa.

Socio-demographic correlates of current drinking among women included increasing age, having any education, working for pay, being married/cohabitating and living in an urban setting. Increasing age was the most common and consistent correlate, and few other correlates were consistent across states. Among older adults in Ghana and South Africa, the most common correlates of drinking pattern included ethnic group, religion and smoking.

Among women, 4 clusters of countries were identified based on the prevalence rates of the different drinking patterns and few correlates were common by cluster or geography, save the high rates of lifetime abstention among Muslim states in northern Africa. The older adult populations in Ghana and South Africa differed on all alcohol measures, while smoking was a common correlate of drinking behavior between the two countries.

Discussion and Conclusion

The high rates of lifetime abstention among African women are consistent with historical and current reports, and rates of risky single-occasion drinking are cause for concern and action. Drinking patterns among older adults in Ghana and South Africa mirror that of the general populations. The correlates identified suggest socio-cultural factors such as religion and tribal association are important factors in drinking behavior, as well as lifestyle factors such as smoking. The variety of drinking patterns and associated correlates across the states among both women and older adults suggests nations would benefit from tailored national alcohol policies that take into account alcohol use among women and older adults, and that continued monitoring of drinking patterns and associated correlates among these groups would be an important piece for understanding alcohol epidemiology in a dynamic African context.

List of Papers

I. Martinez P, Røislien J, Naidoo N, Clausen T. Alcohol abstinence and drinking among African women: data from the World Health Surveys. BMC Public Health 2011 Mar 10;11:160.

II. Martinez P, Landheim A, Clausen T, Lien L. A comparison of alcohol use and correlates of drinking patterns among men and women aged 50 and above in Ghana and South Africa. African Journal of Drug and Alcohol Studies 2011 10;2:75-88.

III. Martinez P, Lien L, Landheim A, Kowal P, Clausen T. Quality of life and social engagement of alcohol abstainers and users among older adults in South Africa. Submitted. Quality of Life Research.

List of Abbreviations

AIDS: Acquired Immune Deficiency Syndrome

CHD: Coronary Heart Disease

DALY: Disability Adjusted Life Years

FAS: Fetal Alcohol Syndrome

GENACIS: GENder Alcohol and Culture: an International Study

HIV: Human Immunodeficiency Virus

ICAP: International Center for Alcohol Policies

ICD-10: International Classification of Diseases – 10^{th} Revision

ICF: International Classification of Functioning, Disability and Health

NESARC: National Epidemiological Survey on Alcohol and Related Conditions

NIAAA: National Institutes of Alcohol and Alcohol Abuse

SAGE: Survey on global AGEing and adult health

WHO: World Health Organization

WHOQOL-8: WHO Quality of Life scale – 8 item version

WHS: World Health Survey

List of Tables and Figures

1.0 INTRODUCTION

Overview

This work is a study of the descriptive epidemiology of alcohol use among special populations in several African countries using publicly available survey data from the World Health Organization (WHO). Alcohol use is a vital component of a nation's health profile as an important risk factor for disease and injury, and differentially distributed across population sub-groups with disparate health and social consequences. Recent studies demonstrate a diversity of alcohol use across the African continent and within nations. Also, Africa as a region is under significant economic development and social change which will likely have consequences for alcohol availability and consumption in the future. Deeper scrutiny of the current status of alcohol use in Africa is thus warranted. Publicly available, nationally representative survey data provides an excellent resource for the production of reliable, valid and internationally comparable alcohol-related health information. International comparisons within regions are useful for providing an accurate overview of the descriptive epidemiology of alcohol use, furthering the theoretical understanding of alcohol consumption, and determining how variations in social and cultural factors can influence drinking behavior. General population studies can, however, overlook the variety in alcohol use of special populations due to low consumption relative to the average or small group sizes, and therefore such groups require deliberate observation. With this study we sought to produce knowledge on the different patterns of alcohol use present among African women and older adults within individual countries and to make comparisons between nation states through secondary analysis of cross-sectional survey data from two WHO surveys in the African region. The information we aimed to produce included the prevalence of various types of drinking patterns, correlates of these patterns and cross-national comparisons of both drinking patterns and associated correlates. This type of information is necessary for the allocation of health funds, development of public health programs and for advancing our understanding of alcohol consumption in the dynamic context of a diverse and emerging Africa.

1.1 Alcohol use and public health

Humans have been producing and consuming alcohol since at least the beginning of recorded history, and likely before the invention of bread (1, 2). The effects of alcohol on the public's health have been and continue to be widely investigated and it is well-recognized that alcohol consumption increases morbidity and mortality. In 2004 the WHO estimated the harmful use of alcohol results in approximately 2.5 million deaths each year (3). Even taking into account the possible protective influence of low risk alcohol use on morbidity and mortality among certain populations, Rehm and colleagues estimated the total number of deaths attributable to alcohol would be 2.25 million (4). These estimates translate into approximately 4% of total *mortality* globally as attributable to alcohol, which accounts for more annual deaths than is caused by HIV/AIDS or tuberculosis.

1.1.1 Alcohol-attributable global burden of disease

The global burden of disease and *morbidity* attributable to alcohol is approximately 4.5%, where the estimate is 7.4% for men and 1.4% for women (3). Alcohol is known to be causally related to at least 60 somatic and psychiatric conditions, detrimentally in most but not all cases (1). The three leading disease and injury categories of all alcohol-attributable disability-adjusted life years (DALYs) globally in 2004 were neuropsychiatric diseases, including alcohol use disorders, (39%), unintentional injuries (26%) and intentional injuries (11%) (3).
While the global morbidity estimate for women is lower than men, women are at a higher risk of a variety of diseases, such as alcohol-related liver cirrhosis and stroke (5, 6). There is also evidence of "telescoping" among women from heavy alcohol use to alcohol dependence (7). The higher estimate among men can be attributed to the fact that they make up a larger proportion of drinkers, drink more overall and engage more often in harmful drinking behaviors (8). Men, in contrast to women's higher adverse health risks, are at a higher risk of adverse acute consequences, such as alcohol-related injuries related to violence and traffic accidents (9).

There are regional variations in the global burden of disease and injury attributable to alcohol use. High-income countries have a much higher disease burden relative to death because alcohol consumption is more common, and since the impact of alcohol-attributable diseases and injuries on disability and poor health is so great. For example, the alcohol-

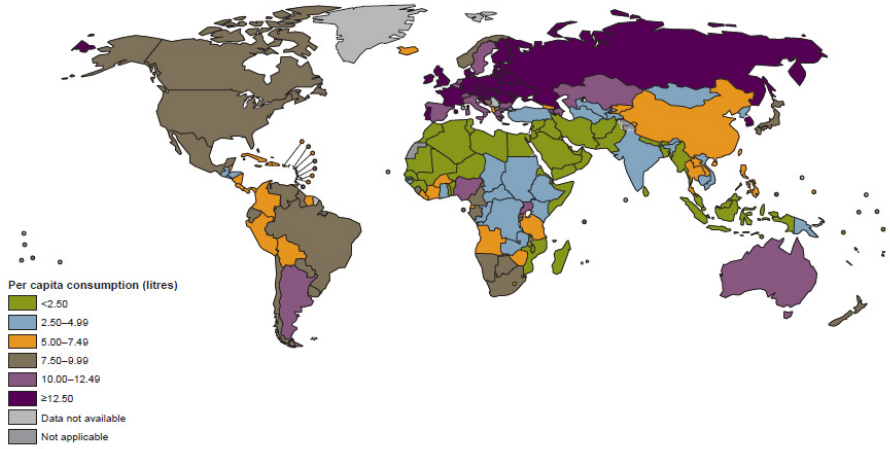
attributable DALYs as a percentage of total DALYs in North America was estimated between 5-9.9%, and between 2-4.9% for North Africa (10). However, low-income countries in general and poor populations within high-income countries have an even greater disease burden per unit of alcohol consumption than do high-income populations and countries (4). This is partly attributed to the higher abstention rates in low-income countries, so that there is a higher average volume consumed per drinker, and thus greater risk for alcohol-related morbidities in these settings. Also contributing to this greater risk is the interaction between alcohol use and risk factors common to low income settings, such malnutrition, crowding and limited access to health care services (11).

1.1.2 Global overview of consumption and drinking patterns

Alcohol use impacts morbidity and mortality through the mechanisms of average volume consumed and patterns of drinking (12), which are in turn influenced by cultural context (13). Consistent with the variation in burden of disease across regions of the world, there is broad diversity of drinking patterns and per capita consumption (Figure 1). In 2005, average volume consumed measured as per capita adult consumption (aged 15 and above) was highest in developed regions, such as North America and Europe, but also in Australia, New Zealand and Argentina. Per capita adult consumption was lowest in developing regions including North and Sub-Saharan Africa, the Eastern Mediterranean, southern Asia and Indian Ocean regions. It is important to note that diversity in per capita adult consumption has been observed within these developing regions (3).

The most common drinking pattern worldwide is abstention. For 2004, the WHO estimated the prevalence of lifetime abstention at 45%, 35% for men and 55% for women (3). Additionally, the WHO estimated past year abstention at 13.1% overall, 13.8% for men and 12.5% for women. Rates of abstention vary widely across regions (Figure 2). The highest abstention rates are in northern Africa and the southern Asian region and the lowest in the Americas and other developed areas. Other patterns of drinking such as heavy drinking during one drinking session also vary worldwide. According to the WHO Global Report on alcohol and health, in 2005 the prevalence of weekly heavy episodic drinking among drinkers in the past 12 months varied from a low of 8% in the Western Pacific Region to high of 25%

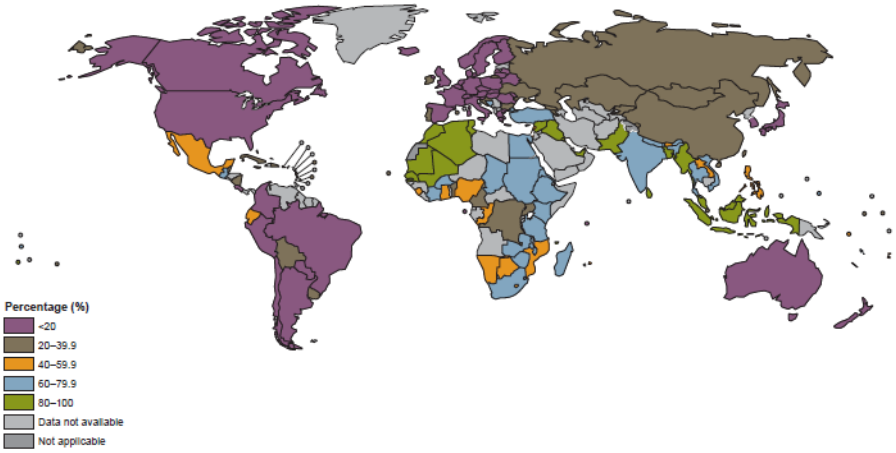
Figure 1. Total adult (15+) per capita consumption, in liters of pure alcohol, 2005



Source: WHO Global Status Report on Alcohol and Health 2011

in the African region (3). The report further noted the lack of a consistent pattern between heavy episodic drinking and country income, although stated wealthier countries in developing regions such as Africa or South-East Asia show an increased likelihood of heavy episodic drinking than their less wealthy counterparts.

Figure 2. Lifetime prevalence of abstention (%), 2004[a]



[a] Best estimates for abstention rates in 2004 based on surveys carried out within the time period 1993–2009.

Source: WHO Global Status Report on Alcohol and Health 2011

Generally, as total average consumption increases, harmful drinking increases. Interestingly, in a 2003 paper Rehm and colleagues concluded that on the country level, per capita adult consumption and a composite drinking pattern score were independent of one another (14). The drinking pattern score was based on drinking patterns assumed to affect the impact of volume of drinking and included aspects of heavy drinking, drinking with meals and drinking in public locations; a higher score implied a higher rate of harm with higher alcohol consumption. The authors observed marked variations in both per capita consumption and drinking patterns across regions worldwide. Work by Rossow and colleagues investigating the association between total consumption and the prevalence of heavy drinkers across several African countries identified a significant association among drinkers only, and not when the total population, including lifetime abstainers, was considered (15). Thus, while total average consumption may generally predict harmful drinking in a population, it may not always be associated with the variety and combination of drinking patterns present in a country, particularly in a context of high alcohol abstention.

1.1.3 Drinking patterns and disease burden

Different drinking patterns are associated with different burdens of disease, and this association is mediated by the socio-cultural and economic environments within which they occur. The two main categories of disease outcomes to which patterns of drinking have been linked are injuries (both intentional and unintentional) and cardiovascular diseases (mainly ischaemic heart disease) (3). The three mechanisms by which drinking pattern can directly influence disease and injury outcomes are (1) toxic and other physiological effects of alcohol; (2) intoxication; and (3) dependence (12). Also, the quality of the alcoholic beverage can be an important factor, for example, if homemade alcohol is contaminated with methanol or lead (3).

Generally, there is a linear dose-response relationship between the average amount of alcohol consumed by an individual and the risk of disease. The well-known exception is for cardiovascular outcomes, where a J-shaped relationship has been observed. Even in this instance, however, the regular consumption of high volumes of alcohol is associated with a greater risk of negative cardiovascular health outcomes. High average drinking volumes have also been associated with risk of injury (12, 16), particularly unintentional injuries

associated with motor vehicle accidents (17). This alcohol-traffic injury relationship has been consistently observed across countries and cultures the world over (18-21), although other interacting factors likely contribute to varying risk estimates between states, such as road conditions, availability of public transport, and seat belt usage.

Reviews of the literature have shown heavy drinking at single occasions is also associated with an increased risk of negative cardiovascular outcomes such as thrombosis and sudden cardiac death (22, 23). Moreover, studies that have used a rigorous assessment of coronary heart disease (CHD) as an outcome and took into account average volume as a confounder lend further evidence supporting this relationship (24-26). Heavy episodic drinking has also been associated with unintentional injuries requiring emergency medical treatment, both in general and related to traffic accidents (17). A recent meta-analysis of acute consumption and injury risk reported a non-linear, positive relationship for both traffic-accident and non-traffic-accident injuries, suggesting even 2 drinks substantially increases risk (27). Heavy episodic drinking has also been consistently related to intentional injuries associated with violence and aggression in general population studies from North America (28-30).
It is noteworthy that heavy episodic drinking has also been regularly linked to an increased risk of HIV infection, which is particularly relevant in areas with high prevalence rates of HIV such as in many African countries (31-33). Also relevant to developing country settings is the association between heavy episodic drinking and depressive symptoms (34, 35) since depression already contributes significantly to disease burden in resource poor contexts and is expected to increase with economic development (36).

1.1.4 Drinking patterns and associated correlates

From abstention to heavy episodic drinking the most stable and consistent demographic correlate across drinking patterns is gender (37, 38). Globally, men are more likely to use alcohol at all, consume more alcohol and engage in regular heavy use and heavy drinking sessions. This gender difference has been observed in all areas of the world, from the Americas (39) to Africa (40) to Eastern Europe (41) and Southeast Asia (42). Evidence of a "gender convergence" where men and women drink more similarly has been noted in some countries, particularly although not exclusively in developed countries and especially in regards to harmful drinking patterns (43-45), although a marked and widespread gender

difference remains the dominant paradigm. Two primary theoretical perspectives offer explanations for the observed gender differences in alcohol consumption – the biological perspective and the socio-cultural perspective. The biological perspective emphasizes the physiological explanations for lower consumption among women compared to men. Women generally have lower body water volume relative to men in which alcohol is distributed, which likely accounts for the observation of a higher blood alcohol level among women compared to men given comparable quantities of alcohol consumed (46). Indeed, several studies that controlled for total body water volume found no gender differences in peak blood alcohol levels (47, 48). There is also some evidence in support of metabolic gender differences explaining the differential effect of alcohol on women compared to men, such as lower "first pass" metabolism of alcohol among women (49), the effect of sex hormones (50), the rate of alcohol metabolism in the liver and subsequent harmful exposure to acetylaldehyde (51, 52), and the influence of the menstrual cycle (53). Much of the research on metabolic differences has only been investigated in animal models (51) or there are contradicting results (54, 55), and many unanswered questions remain. As pointed out by Wilsnack and colleagues, some further differences between and within men and women that might be expected if biology explained much of the gender difference in alcohol use are not observed, such as differences in alcohol use between people with different body water volume within a gender group (38). The alternative socio-cultural perspective posits gender roles and gender differences in drinking behaviors as reasons why women consume less alcohol than men. An example of traditional masculinity among men may be heavy alcohol use (56), whereas traditional femininity may be expressed in limited and controlled alcohol use, or total abstinence (57). Social expectations and structures promoting differential behavior may also manifest in gender differences in the pace of drinking, drinking with meals, beverage choice and size, place of consumption and alcohol use concomitant with illicit or prescription drugs (58). Thus, the different ways men and women may use alcohol can moderate biological differences in the consumption and response to alcohol; both biology and socio-cultural constructions help explain the current paradigm of widespread gender differences in alcohol use.

Research has shown that drinking patterns can also vary by age with notable regional differences. In the US, current drinking has been shown to decrease with age (28, 59), while

in several European countries an increase in current drinking with age has been observed (60). Heavy drinking at single sessions has been observed at higher levels among younger age groups in general population studies in the US, Scandinavia and South Africa (59, 61, 62), and is generally less common among older adults in the US (63). However, increasing rates of heavy drinking at one occasion have been observed in the US (64), Denmark (65) and Brazil (66).

Socioeconomic status is another principal demographic related to drinking behavior. Generally, the observed pattern is that persons in higher socioeconomic groups are more likely to be drinkers and drink in moderation, while persons in lower socioeconomic groups are less likely to drink but engage in more harmful drinking patterns (67-69). Consistent with this observation, a recent publication by the Gender Alcohol and Culture: an International Study (GENACIS) group using data from 33 countries observed a positive association between higher socioeconomic status as measured by educational attainment and current drinking status, and similarly a higher proportion of drinkers among higher income countries (70). Furthermore, they also observed higher odds of being a risky single-occasion drinker among men with lower socioeconomic status. Divergent from the general pattern was the finding that women with a higher socioeconomic status in lower income countries had a higher likelihood of risky single-occasion drinking than women in a lower socioeconomic group. Thus, a relatively higher socioeconomic status is not always associated with a moderate drinking pattern, and may indicate changes in drinking patterns among certain groups.

Tobacco use is a common correlate of alcohol use, where drinkers are more likely to be smokers than non-drinkers, and smokers are more likely to be drinkers than non-smokers (71, 72). Also, increased rates of tobacco use are associated with increasing levels of alcohol use (72). This co-occurrence has implications for the risk of adopting one behavior if the other is present, and the ease of reducing or stopping one behavior in the presence of the other (73, 74). Anthony and colleagues observed the highest rate of co-use among younger populations and a decline in the co-occurrence thereafter (71). The frequent co-occurrence between drinking and smoking can be understood at the physiological, psychological and societal levels (75). Physiologically, the administration of nicotine has shown to increase

alcohol consumption (76), potentially through the mechanism of dampening the effects of alcohol when smoking so that more alcohol would be consumed (77). Psychologically, similar personality traits between drinkers and smokers may encourage the use of both nicotine and alcohol, such as impulsivity and sensation-seeking (78). Also, there is an association between the time and place and concurrent use of alcohol and nicotine (e.g. smoking and drinking at a party), so that one may cue the other (79). These event level associations may vary by culture, however, since precisely when both smoking and drinking occur, either individually or together, is socially sanctioned and can vary according to different socio-cultural norms (80). At the societal level, prevailing ideas around what it means to be a "smoker" and/or "drinker", laws and regulations about when, where and who can smoke and drink, and group identities (religious affiliations, "rebel/outcast") will influence the concomitant use of alcohol and nicotine.

Persons who consume heavy volumes of alcohol regularly, such as persons with alcohol abuse problems, often experience lower levels of quality of life than their moderate drinking or abstaining counterparts (81, 82). Reports of a higher quality of life among moderate, current drinkers compared to former drinkers, abstainers and high consumers, suggests an inverse U-shaped relationship between quality of life and alcohol use (82-84), potentially reflecting the positive social aspects of moderate alcohol use. Following this logic, social engagement can also be variable across different drinking patterns. Social engagement can reinforce drinking behaviors or be consequent to established alcohol using patterns (85, 86). A prominent example of this is religion, where religious affiliation has been identified as a strong predictor of drinking behavior in all regions of the world. The most consistent pattern is alcohol abstinence among Muslims, as it is dictated through Islamic doctrine and where social controls of alcohol are widespread and severe.

1.1.5 Drinking cultures

A variety of drinking cultures exists worldwide and different drinking cultures reflect the various social, political, economic and cultural environments, and can have differential effects on public health. Drinking cultures can be broadly described as the particular combinations of drinking patterns observed within a population. Traditionally, they have been described on the foundation of a country's "high" or "low" per capita consumption and

referred to as the wet/dry dichotomy (87). Wet cultures are described as cultures where alcohol is an integral part of everyday life and is widely accessible, and where abstention and heavy drinking rates are low. Conversely, in dry cultures where alcohol is not a common part of everyday living, access is more restricted, and when alcohol is used it often leads to intoxication. This nomenclature has mostly been used to describe and compare North American and European countries, and is problematic given its uni-dimensional nature. Room and Makela have suggested a new typology taking into consideration several additional drinking behaviors, such as the regularity of alcohol use and the extent of intoxication (13). The evidence showing growing deviations from this framework as drinking cultures change and the discussions about the limitations in its utility have made its application less common, with a turn instead towards accurate descriptions of drinking patterns and their consequences. Indeed, in a 2003 review article Rehm and colleagues acknowledged the heterogeneity of drinking within a country and suggested future research should be based on distributions of drinking patterns by sex and age, as opposed to a single pattern value or label (12).

1.2 Alcohol use and public health policy

Contrary to popular belief, evidence-based public health policies and prevention programs can effectively reduce the negative health impact of alcohol use. One of the most efficacious policies is increasing alcohol prices through raising alcohol taxes. A recent meta-analysis of 50 studies demonstrated a reduction in alcohol-related morbidity and mortality, violence, and traffic fatalities among other outcomes with higher alcohol prices and taxes (88). Other public health alcohol policies with demonstrated efficacy include bans or limitations on alcohol advertising and limits on alcohol availability. Much of the theory upon which such alcohol policy measures are based is the total consumption theory developed by Skog in the 1980s. This theory postulates that a population will move up and down the scale of alcohol consumption in concert, and total mean consumption will predict the proportion of heavy drinkers (89). Thus, lowering total mean consumption in a population would lower the rates of harmful drinking and alcohol-related harm. Controversy still exists about the interpretations and empirical testability of this theory (90), and efforts continue to be made to investigate its applicability to different cultural settings (15), but its influence on

contemporary alcohol policy is substantial. This theory is discussed in more detail in section 1.3 *Epidemiologic theory and alcohol use* below.

The majority of low and middle income countries lack national alcohol policies, or the enforcement of policies is minimal and inconsistent. Recent research in Thailand studying alcohol taxation showed promise in limiting the initiation of alcohol use among abstaining youth and reducing alcohol-related harm, indicating evidence-based alcohol policies can be implemented and effective in a low-income setting (91). Generally, research on alcohol policies in resource-poor settings is lacking and more work is needed to elucidate what kinds of alcohol policies may be effective and the extent of their effects. A first step in developing public health policies in any setting is reliable information on the levels of local patterns of consumption, the distribution of use across population sub-groups, and factors associated with different patterns of use (92).

1.3. Epidemiologic theory and alcohol use

The purpose of this section is to introduce and discuss epidemiologic theory, and theories about the epidemiology of alcohol use. Together this will describe the theoretical framework upon which this work is built. Epidemiology will be defined and the application of this definition to this work explained, followed by a description of social epidemiologic frameworks and concepts underlying epidemiologic investigations and how they are germane to this work. Finally, theories that propose explanations for the observed epidemiology of alcohol use will be presented, namely, the collectivity of drinking cultures, the prevention paradox, and concepts related to gender differences in alcohol use.

1.3.1 Epidemiology defined and applied

Epidemiology is classically and succinctly defined as the study of the distribution of disease and its determinants in a population (93). Social epidemiology is a distinctive sub-category of epidemiology through its explicit intent on investigating social determinants of population distributions of health, disease, and wellbeing, in contrast to setting such determinants as the background for biomedical phenomena (94). A more comprehensive definition of epidemiology is presented by Szklo and Nieto, which states epidemiology is the study of the distribution and determinants of health-related states or events in specified populations and

the application of this study to the control of health problems (95). This work operates under the direction of social epidemiology and subscribes to the latter definition of epidemiology.

There are several reasons for choosing to work under the umbrella of social epidemiology and to subscribe to Szklo and Nieto's definition of epidemiology. Firstly, it is because of social epidemiology's explicit aim to understand the social determinants that help explain the distribution of health and disease in populations. This is consistent with this study's attempts to observe and identify socio-demographic characteristics associated with different patterns of alcohol use among women and older adults in several African states. The term *social determinants* can mean a range of social constructs at a variety of levels. The WHO defines 'social determinants' as related to health as "the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies, and politics" (96). In this work, social determinants are investigated at the individual level as a measure of social position, and not at the societal or structural level. That is, information on sociodemographic characteristics of the individual such as marital status, education and employment are observed in relation to pattern of drinking, as opposed to measures of macro-level factors such as access to health care and education, employment opportunities, density of alcohol outlets, policies towards serving alcohol, and ubiquity of alcohol advertisements. Moreover, while we aim to identify alcohol use behavior according to different social circumstances or characteristics, for example, living in an urban setting, we do not address the larger question about why an urban-rural dichotomy exists or how this may be related to alcohol use. There are critics of this limited perspective on what a "social determinant" is and how it is applied to understanding the distribution of health (97, 98). These are indeed important levels of social determinants influencing health, but they are beyond the scope of this project.

As regards the latter definition of epidemiology, one reason I work under this definition is because alcohol use per se is not a disease and not only a determinant of disease. While it is causally related to many diseases, it does so in a complex inter-play with a variety of other factors, from biological to social to environmental. Even in alcohol use disorders, where alcohol is obviously a causal factor and necessary for the development of alcohol use

disorders, the heavy use of alcohol alone is not sufficient to induce these disorders. Moreover, even when alcohol use is not "pathological" in the sense of a clinically diagnosable disorder, as it mostly is in a given population, it can have serious negative health and social consequences for the individual and at the population level (4). Thus, I believe it is useful to conceptualize alcohol use as a health-related state, assumed to have its own distribution in populations and sets of determinants, while also acting as a determinant of other health-related states in concert with other determinants. Another reason I subscribe to Szklo and Nieto's definition of epidemiology is because it states that we study health-related phenomena in "specified populations", rather than simply "populations". It may be a minor point, but I think it is important as a reminder to specify which populations we are investigating and why, with the understanding that populations will differ across space and time, and that all relevant populations affected by a particular health-state or disease, however specified, deserve study. Finally, I am using this definition of epidemiology because it connects the results of epidemiologic study with the actions and information used to manage the health problems of populations. The application of epidemiologic findings is important in justifying the undertaking of such investigations, which are often costly and time-consuming and publicly-funded, and for giving purpose and focus to the substance of our investigations by studying health issues germane to the time and place of study. In regards to alcohol use in populations in particular, this translates into studies of alcohol use that produce information useful for guiding future investigations testing and developing theories of alcohol use distribution in a population, informing alcohol policy at community and national levels, and developing preventions and interventions where needed.

Epidemiology can be classified as descriptive or analytical. According to Cwikel, in descriptive epidemiology, the basic question posed is "how is a specific health problem distributed in the population of interest?", with a focus on the parameters of who, what and where (99). Descriptive epidemiology aims to answer the questions about who are the people affected by a particular health-related state or behavior, what personal characteristics or behaviors do they have, and where do they live, work and play? In other words, how do we characterize this specific health problem by person, place and time? The aim is to measure the distribution of key variables in the population of interest without testing causal hypotheses. This is in contrast to analytical epidemiology which seeks to answer the

questions of how and why health-related states are distributed in a population in a particular way, with the explicit aim of testing causal hypotheses. Assumptions about the possible causal pathways may underlie descriptive studies. For example, the frequency of binge drinking might be evaluated among people who have been diagnosed in the past year with a chronic illness and compared with people who have not; this investigation may rest in part on the potential causal assumption that being ill might cause a decrease in binge-drinking behavior due to concerns about exacerbating disease symptoms, interactions with medications, being physically unable to consume large amounts of alcohol or concerns and expectations from family and friends. Such a descriptive study itself, however, is not designed to answer the question of whether being diagnosed with an illness causes a decrease in binge drinking. Such studies often use measures taken at a single point in time so that only associations can be observed. Even if several time points are available, at best they can only suggest causality since they are not experimental designs capable of testing causality.

This work is a study in descriptive epidemiology under the aegis of social epidemiology because it aims to observe the distribution of alcohol use among the specified populations of women and older adults in several African countries, and to identify key socio-demographic variables, or correlates, of different drinking patterns. More specifically, it aims to observe who are the women and older adults who engage in various drinking patterns, for example, where they live (at both the micro level – in an urban or rural setting, and macro – African country), if they're married, what their employment status is, and what other health-related behaviors, such as smoking, might be associated with different drinking patterns. This work takes this description a step further by making comparisons between nation states, in an effort to observe the specificity or universality of distributions of drinking behavior and associated correlates.

1.3.2. Epidemiologic theory

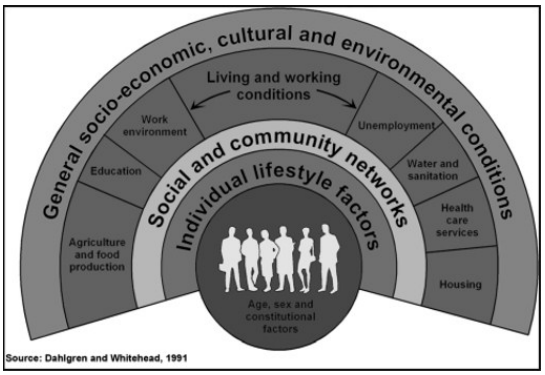
In the book Epidemiology and the People's Health, Nancy Krieger wrote that "epidemiologic theory is about the health status of populations – in societal and ecological context (94). It is not about why specific individuals become ill or stay healthy." Krieger goes on to purpose that epidemiologic theory's defining question is "Who and what determines population rates

and distributions of morbidity, mortality, and health?" One of the central tenet's of the book is that there is a need for more sophisticated and integrated epidemiologic theory, and that much of what epidemiologists have used for theory in the past was based on and grew out of the biomedical model of biological agent causing biological disease, with little to no regard for the ecological or social context within which health and disease status manifests.

Social epidemiology is comprised of a variety of theories and concepts that as a general rule challenge the biomedical thinking of reducing explanations of disease occurrence to disease mechanisms within an individual organism (94). Broadly speaking, social epidemiologic theories assert that "societal processes drive the social patterning of population distributions of health and disease" and that these processes run "diametrically opposed to the biomedical assumption that diseases arise from intrinsic characteristics of individuals, whether biological or behavioral". As delineated by Krieger, such theoretical frameworks are premised on the ideas that 1) distributions of health and disease in human populations cannot be understood apart from their societal context, and necessarily occur within them; 2) social processes causally (albeit probabilistically) determine any health or disease outcome that is socially patterned; and 3) the prediction that changes in a society, whether in social, economic, cultural or technological features, will lead to changes in their population levels and distributions of health and disease. Under this general theoretical framework is the related concept of social determinants of health.

Underlying and related to the term social determinants as described above is the concept of social determinants of health, which refers to the concept that people's capacity to live healthy lives is determined by their socioeconomic position, race/ethnicity, and gender, in conjunction with the social and physical quality of their immediate environments – neighborhoods, schools, workplaces, transport – and access to healthy food, education and quality health care (94). In this way, social determinants of health can be seen as an individual's resources that arise from a particular "social environment" structured by policies and social hierarchies, where different groups are differentially exposed to factors that influence health status and which thus can, and often do, result in social inequities in health (96). Dahlgren and Whitehead illustrated a conceptual model of the social determinants of health as shown in Figure 3 below (100).

Figure 3. Model of social determinants of health from Dahlgren & Whitehead, 1991



Social epidemiologic theory and the concept of social determinants of health provide the theoretical background for this work because they recognize the inseparability of social context from health, and the different levels of social organization through which health is influenced. Social determinants of health helps focus this framework on the relevance of a person's social position to the likelihood that they will develop a disease or experience harm or enjoy a healthy life. This study operates under the explicit understanding that alcohol use by an individual is predominantly influenced by the social environment within which one lives. This social environment encompasses basic sociodemograhic characteristics – age, gender, income, education level –, broader environmental factors – access to health information, availability of alcohol –, social and cultural norms that decide gender roles and expectations around alcohol consumption, and political and economic forces setting laws and regulations governing alcohol as a commodity.

1.3.3 The collectivity of drinking cultures

The collectivity of drinking cultures, also commonly referred to as the total consumption theory, was presented by Ole-Jørgen Skog in his seminal paper in1985 and is a theory about the distribution of alcohol consumption in a population (89). The theory has two tenets: 1) the mean level of consumption in a population determines the proportion of "deviant" behavior or heavy drinkers and 2) the population will tend to move up and down the scale of consumption collectively. These are based on two hypotheses about the form of the factors influencing human drinking behavior, and the mechanisms by which they exert their influence; these hypotheses assume an individual's drinking behavior is influenced by a

range of factors, and that these factors are approximately independent. Skog's first hypothesis was that the various factors influencing drinking behavior would combine multiplicatively, explaining the often observed right-skewed distributions of alcohol use. The second hypothesis states that an individual's drinking habits are strongly influenced by the drinking habits of her or his personal network, giving rise to the theory that population changes in mean alcohol consumption will be shared across the population of drinkers so that the group moves collectively. These two tenets are related in that the movement of the whole population up and down the scale of consumption means the proportion of heavy drinkers, or people drinking above a pre-determined limit, will also necessarily change. Thus, the mean consumption of the population is directly related to the proportion of heavy drinkers in the population.

Skog commented that one of the limitations of the theory of the collectivity of drinking cultures was that it was based on data from industrialized regions only, namely Europe, North America and Australia. He thus hypothesized that the potentially variant mechanisms by which other populations may be influenced could give rise to different consumption distributions and patterns of change. Specifically, he suggested the difference in the severity of formal or informal social control exerted over drinking in non-industrialized regions influencing the nature of drinking behavior might mean the theory would not be applicable in these settings. The applicability of the theory of the collectivity of drinking cultures has, to my knowledge, only been explicitly investigated in a work by Rossow and Clausen currently under review (15). This work used WHS data from 20 African countries and observed a skewed distribution of alcohol use, and a relationship between mean consumption and the proportion of heavy drinkers, suggesting that the theory holds in a context with different formal and informal social controls on alcohol use compared to industrialized regions, contrary to Skog's hypothesis that it would not.

The theory of the collectivity of the drinking cultures has important implications for how to address problem drinking in a population. Since the proportion of heavy or "problem" drinkers is predicted by mean total consumption, policy directed at reducing total consumption would also effectively lower the absolute number and proportion of problem drinkers, assuming the size of the population remains stable. This theory thus gives support to broad policies targeted at reducing consumption by the entire population of drinkers to

lower mean total consumption and thus reduce the proportion of heavy drinkers. Several common, standard policies are based on this idea and attempt to do as much, for example, limiting access to alcohol through minimum age requirements for the purchase of alcohol, state-controlled outlets, and limited times when and where alcohol can be sold and served.

1.3.4 The prevention paradox

Geoffrey Rose first proposed the idea of "the prevention paradox" in an article published in 1981 regarding the prevention of cardiovascular disease (101). He expanded on the idea in the seminal article "Sick individuals and sick populations" in 1985 (102) and his book "Rose's Strategy of Preventive Medicine" in 1992 (103). The prevention paradox is "a preventive measure which brings much benefit to the population but offers little to each participating individual." It is based on the observation that a large number of people at small risk of disease or injury may result in more cases of disease or harm than those who are at high risk. Thus, a population strategy of prevention (i.e. – a strategy targeting the entire population) would be more effective at reducing the overall burden of morbidity than a high-risk strategy (i.e. – a strategy targeting high-risk groups).

Norman Kreitman applied the concept of the prevention paradox to alcohol consumption in his 1986 paper "Alcohol consumption and the prevention paradox" (104). He acknowledges that the individual risk of disease and injury at higher levels of consumption is without doubt, but that this individual risk does not speak to the contribution to disease or injury at the population level. Indeed, his work and work done since has demonstrated that moderate or low risk drinkers make up a greater proportion of those experiencing alcohol-related problems than do high risk drinkers. Part of this observation is explained by the simple fact that there are more moderate drinkers in a given population than high risk drinkers. Also, and more obviously, alcohol-related harm or problems are not limited to high risk drinkers. Thus, strategies targeting high risk groups should not be equated with strategies to reduce harm for the population at large.

Stockwell contributed to the prevention paradox theory by noting that in the above studies the pattern of use was not assessed, and presented data showing that when the amount of alcohol in a single episode is assessed, the prevention paradox is no longer observed (105).

That is, “binge” drinkers among those whose average consumption can be considered “low risk” or “moderate” make up a larger proportion of those experiencing alcohol-related problems than “binge” drinkers whose average consumption can be considered “at risk”. This supports the intuitive notion that most binge drinking is found among people who drink at a moderate annual-consumption level, and has been coined the *second-order* prevention paradox (106). The observation that the pattern of alcohol use affects the distribution of alcohol-related harm among drinkers is an important one as it shows the necessity of measuring drinking pattern in addition to total consumption, and helps define and identify a drinking behavior associated with alcohol-related harm.

The prevention paradox and collectivity of drinking cultures overlap in that both provide theoretical support and empirical evidence for the efficacy of population based prevention strategies for the negative impact of alcohol use. Further, they predict the success of alcohol measures applicable to an entire population, drinkers and non-drinkers alike, in reducing alcohol-related harm at the population level. Both theories suggest populations will benefit from a reduction in alcohol-related harm if they use strategies to reduce consumption by moderate drinkers a little versus by heavy drinkers a lot.

1.3.5 Theories regarding gender differences

The gender difference in alcohol consumption is one of the most consistent and persistent differences in a health-related behavior observed the world over. While biology likely plays some role in this difference, the variation in the size of the gaps between men’s and women’s drinking behavior across cultures and regions suggests cultural and social-structural explanations also play an important role (107). In Chapter 1 of the book Alcohol, Gender and Drinking Problems, Wilsnack summarizes the literature on potential reasons explaining the gender difference in alcohol use, which suggests four explanatory concepts: power, sex, risk and responsibilities. These concepts are briefly presented below.

Power. The concept of power is often used to explain gender differences because of the power differential between men and women, where men have more power relative to women. The consumption of alcohol can be used symbolically as a show of power by men; a privilege reserved for men and often denied to women (108-110). Similarly, men’s ability to consume large amounts of alcohol without obvious impairment may help demonstrate

"manliness" (111). The increase in aggression often associated with alcohol use may also facilitate the feeling and exercise of power, which is experienced more by men than women (112). Evidence suggests men who want to act aggressively learn they can do so with the aid of alcohol in certain circumstances (113, 114).

Sex. The expectation that alcohol will improve sexual performance, enjoyment or the likelihood of a sexual encounter is shared by both men and women (115) although there is some evidence such expectations may be more influential among men than women (116). The fear that women may become sexually disinhibited when drinking alcohol has fueled policies and social expectations that women abstain or drink "responsibly" (McLaughlin, 1991), potentially under the desire to limit women's sexual behavior or prevent the likelihood of sexual assault. The incentive to reduce vulnerability to sexual advances may cause some women to limit their alcohol consumption, particularly in the presence of men.

Risks. Generally, men are more likely to take risks than women, and men's higher consumption of alcohol can be viewed as risk-taking. Risk-taking may be more rewarding for men and may demonstrate masculinity; this would be in contrast to the idea that a heightened perception of risk and desire to avoid it demonstrates femininity (117). Evidence supports the idea that there are gender differences in risk-perception or risk-taking propensity that influence drinking behavior (118, 119), although these may be more relevant in adolescence and early adulthood (120).

Responsibilities. Another explanatory concept for gender differences in drinking is the effect of social responsibilities. Operating in different directions, social responsibilities among men may influence heavy drinking behavior as a way to ignore responsibilities or demonstrate the ability to negate or avoid obligations (121). This contrasts the idea that among women, social responsibilities, particularly in the home, may influence reduced drinking in an effort to ensure responsibilities are fulfilled (122, 123). This mechanism is not always observed among women across cultures or drinking patterns (124). Some findings support the idea that women may drink to relieve stress, potentially due to the many roles and responsibilities women are often expected to undertake (125).

The explanatory concepts described above have mostly been investigated in resource-rich settings. However, it is well understood that gender-specific roles and expectations exist in Africa due to cultural traditions, religion and social structures (109, 110, 126). Moreover, there is concern about the effect of the social status of women on health behavior, including drinking behavior (127). So while recognizing the exact mechanisms and manifestations of the concepts may differ among cultures and countries, this work rests on the assumption that these concepts are applicable and provide some theoretical background for the socio-cultural explanations for gender differences in alcohol consumption in Africa.

1.4 Definitions and measures of alcohol use

1.4.1 Average volume and adult per capita consumption

Average volume of alcohol consumed by a population can be measured at the individual level or at the aggregate level. At the aggregate level, adult per capita consumption calculated from records of total alcoholic beverage production, sales, imports and exports and divided by the number of adults in the population (often persons aged 15 and above) can provide total consumption and population mean estimates. Per capita measures do not, however, provide information by age, gender or other relevant factors so that measurements and comparisons among sub-groups are not feasible. Moreover, drinking patterns, such as heavy alcohol consumption at one session, cannot be observed. At the individual level measurements of alcohol use are taken from each person, often through surveys using standardized questionnaires. Average volume consumed can be calculated from such individual-level data, but these are often assumed to be underestimates of actual consumption (87). Individual level data on alcohol use often includes a variety of demographic and health information so that in addition to the observation of drinking patterns, the identification and comparison of drinking patterns by sub-groups, and correlates of drinking patterns is permitted.

1.4.2 Drinking patterns

The scientific literature on alcohol consumption uses the nomenclature of “drinking patterns” to describe the various ways people use alcohol as part of their life experience. Drinking patterns are often based on an individual’s self-reported frequency of alcohol consumption and volume consumed. In the simplest form, people are asked to estimate how

often they drink and how much they drink on a typical drinking occasion (87). The most frequently discussed shortcoming of this quantity-frequency measure is that respondents will tend to overlook sessions of heavy consumption. To circumvent this issue, persons can be asked about their consumption on recent occasions, called the “recent-recall” approach, and daily diaries of alcohol use over a specified period of time are a common tool in this approach.

The volume of alcohol consumed is operationalized through the basic unit of measurement - the “standard drink” - so that volume of alcohol consumed is based on the number of standard drinks. The term is intended to represent a unit of alcohol as measured by the amount in grams of alcohol present in an alcoholic beverage, regardless of type and volume. Given the variety of common drink sizes and alcohol content across countries, the number of grams of alcohol per “standard drink” can vary between 8 and 14 grams (87, 128). Different drinking patterns are defined according to different combinations of volume of alcohol consumed and the time over which consumption occurred. Never having taken a drink ever is an important drinking pattern, that is, being a lifetime abstainer. Abstention from alcohol is also often defined as not having had a drink over a certain timeframe, such as the last 12 months. Being a "current drinker" is also often variably defined between studies, where "current drinking" might be having had at least one drink over the last 12 months to a drink in the last 7 days.

Whereas the above drinking patterns serve to identify drinking frequency of *any* alcohol consumption over a period of time, other drinking patterns aim to describe drinking behavior that is associated with either a decreased or increased risk of alcohol-related harm. Low risk or moderate drinking is variably defined worldwide but often defined in the range of no more than 1-3 drinks a day. Heavy drinking is defined as consuming a high quantity of drinks over a period of time (e.g. – one week, one month), and risky single-occasion drinking, colloquially known as "binge" drinking, is defined as consuming a high volume of drinks at a single drinking session. The number of drinks that should quantify a "high volume" of drinks for both heavy drinking and risky single-occasion drinking remains controversial, and there are no internationally agreed-upon standards. Further complicating the issue for both low risk and heavier drinking patterns are gender and age, since evidence suggests different

standards should be applied between men and women, and between younger and older adults (129, 130). Nonetheless, a fair amount of literature has used at least 15 drinks per week as a cut-off for heavy drinking, and 5 or more drinks per session for risky single-occasion drinking. Variations on this include the guidelines for adult alcohol consumption from the American National Institutes of Alcohol and Alcohol Abuse (NIAAA), which suggest 8 or more drinks per week for women and 15 or more for men as cut-offs for heavy drinking, and at least 4 drinks for women and 5 drinks for men in a drinking session as cut-offs for risky single-occasion drinking. The guidelines for moderate drinking are no more than 2 drinks per day for women with no more than 7 in a week, and no more than 3 for men with no more than 15 in a week (131).

1.5 International comparisons of alcohol use

International comparisons of alcohol use, particularly within regions that may share historical and cultural characteristics, are useful for global and regional overviews, and for evaluating the effects of socio-cultural and other country-specific components on alcohol consumption. In making international comparisons, Bloomfield remarked in a 2003 paper on the importance of taking drinking culture into account when deciding on the alcohol measures whose validity will be contingent on the drinking cultures to be compared (87). This article also provided the example of how a basic quantity-frequency index assessing "typical" consumption may provide accurate values in a wet drinking culture, but may perform less well in a dry culture where risky single-occasion drinking is common. Bloomfield also stated that no single instrument is best given the variety of drinking cultures, but emphasized the use of a standard instrument flexible enough to measure most drinking patterns and ensure comparability between different drinking cultures.

1.6 Alcohol use in Africa

1.6.1 Historical overview

Alcohol has been part of the social and religious life of Africa since the third century B.C (126, 132). In pre-colonial Ghana, alcohol was believed to unlock the spiritual realm and allow communication with ancestors and gods (110). Netting described the Kafyars of West Africa as a people who "make, drink, talk and think about beer…and believe that man's way

to God is with beer in his hand" (133). Women and young men were excluded from the use of drink because of its potent spiritual power, which was reserved for male elders (134). Alcohol was produced and distributed locally, often by women in home-based facilities. Alcohol was an integral part of ceremonies such as naming children, marriage, funerals, judicial processes and legal contracts. Hard liquor in the form of rum was introduced in the slave trade, and subsequent urbanization led to the development of public drinking establishments, introducing routine social drinking as part of modern culture in many African settings.

1.6.2 Contemporary overview

Alcohol is the most widely distributed and commonly used substance in Africa, even the most rural areas in Africa have reliable production and distribution systems (126, 133). Levels of alcohol use differ greatly between countries in Africa (4, 135, 136), and these differences are attributable to differences in ethnic diversity, religion, level of welfare and industrialization, availability of alcohol, acceptability of alcohol in society, and political and economic stability (137). While one of the most striking changes in alcohol use in Africa from pre-colonial to contemporary times is the introduction of large-scale commercial production and marketing (109), homebrew or alcohol produced by small-scale illicit distillers remains one of the most commonly used types of alcohol. This is consistent with the observation that much of the alcohol used in developing countries where alcohol use is low is served by homemade or illegally produced alcohol in part because it is cheaper, in contrast to developed countries where alcohol use is higher and most of it is recorded legally produced alcohol. The exact amount of homebrew consumed is difficult to estimate, and even attempts at documenting "unrecorded" consumption are of limited use in determining homebrew consumption per se because it includes measures of untaxed or unregistered alcohol which can include commercially produced alcohol smuggled into the region. Still, it is estimated that unrecorded consumption accounts for at least 50% of all alcohol consumption in Africa, which in this context could reasonably be assumed to consist predominantly of homebrew (138).

Although alcohol-related problems across African countries are quite heterogeneous, some clear similarities can be found. Alcohol is a causal factor for intentional and unintentional

injuries and social and physical harm to the drinker and people other than the drinker. This includes reduced job performance, family deprivation, interpersonal violence, mental health problems, fetal alcohol syndrome, alcohol use disorders and alcohol-related traffic fatalities (6). Furthermore, it is an important contributing factor for risky sexual behavior, sexually transmitted diseases, and HIV infection and disease progression (31, 139). In Sub-Saharan Africa 2.2% of all deaths and 2.5% of all DALYs are related to alcohol (10).

The historically narrow demographic of older adult men as the primary consumers of alcohol in Africa is currently expanding. Odejide and colleagues found that the use of alcohol ranged from 52% to 56% among students from the western part of Nigeria (140). Also in Nigeria, men belonging to higher occupational groups were significantly more likely to have alcohol-related problems (141). A study done in an over-populated slum area of Nairobi revealed that 46% of males and 24% of females reported alcohol abuse (133). In Uganda, purveyors of local alcohol production and retail are associated with a history of alcohol consumption (142).

There are hundreds of ethnic groups in Africa, defined by language, culture and history. Identifying with a particular ethnic group or tribal affiliation can influence if, how and why alcohol is consumed. One of the ways this influence may be mediated is by culture and traditions (143). The meanings, expectations, production, distribution, traditions and uses of alcohol can vary greatly based on culture. Culture dictates who, when, where and for what purpose alcohol can be consumed. As noted above, in many African tribes, but not all, women would brew the alcohol while elder men consumed it, and abstinence was expected among young people (144). Among the Iteso in Uganda and Kenya, beer was an integral part of social and spiritual rituals (145). The tribes of southern Ghana viewed alcohol as containing potent spiritual power, and that “without alcoholic drinks, one could not communicate through libation with the ancestors and the gods” (146). While the important contemporary social changes such as urbanization, the spread of technology, and changing gender roles may render the specific practices less relevant, the connection to a belief system with its meanings and understandings towards alcohol will likely still influence alcohol use (147). Another important factor in ethnic or tribal affiliation in Africa playing a role in alcohol use is history. The colonial history of many African countries involved

regulations around alcohol production and use. In the early part of imperial expansion, the European colonies' primary interest was in developing a regulated economy of the production of traditional beverages and the newly-introduced distilled beverages (144). Alcohol was also a common tool of the colonial powers to attract, pay, entertain and control indigenous labor workers (148). In the latter part of imperial control, efforts began to limit the availability of alcohol to indigenous groups (149). This was in part due to the temperance movements in the European and North American countries, but also because of concerns about alcohol's associations with idleness and insurrection (150). Since not all colonial powers operated in the same way, and not all groups were under imperialist control, the various histories between ethnic groups may contribute to differences in alcohol use.

Given the historical and current lack of a solid health care and information infrastructure in the vast majority of African countries, there is a lack of information on the epidemiology of alcohol use in the region. Further, while important local studies have investigated alcohol use, and problem drinking in particular (151), much has been in the context of HIV risk and infection (152), and few coordinated studies have been conducted so as to make cross-national comparisons within the region feasible. As has been the case in Europe and the USA (153), understanding the epidemiology of alcohol use at a population level is a requirement for the development of effective public health prevention interventions and policies.

1.6.3 Alcohol use among African women

Alcohol use among women in Africa has traditionally been quite low, and high rates of lifetime abstention persist in many African countries (3). However, population-based surveys have documented rates of alcohol use and harmful drinking among African women that raise concern, including risky single-occasion drinking and regular high consumption (154). Prevalence of alcohol use in the past-year among women was estimated at 30% in Botswana and 47% in Namibia (10, 155). Heavy drinking was found in 38% of women currently drinking in Nigeria and 20% among current female drinkers in Uganda (156, 157). The negative consequences of harmful alcohol consumption are illustrated by studies that have identified women's alcohol use as a risk factor for HIV infection in Uganda and South Africa (158, 159), and the high rates of Fetal Alcohol Syndrome in South Africa (160). From the limited evidence available, factors associated with alcohol use among women in low to middle

income countries include being single, higher socio-economic status and higher levels of education (161-163).

Reports produced by international organizations such as the World Health Organization or the Demographic Health Survey consistently and necessarily report alcohol use by gender (10). Since consumption is often much lower among women than men, further investigations into correlates of drinking or the different drinking patterns among the few who do imbibe are often lacking. As has been clearly stated by the alcohol industry, African women are an untapped market representing an enormous potential for an increase in profits from the region (164). If governments and public health officials are to gauge changes in alcohol use and monitor the various consequences as the industry expands its presence in Africa, baseline information about current patterns of drinking and associated factors is needed.

1.6.4 Alcohol use among older adults

Generally and consistent with traditional distributions of drinking in Africa, alcohol use is more common among middle-aged and older adults compared to younger generations (135). The term "older adults" in this work refers to adults aged 50 and above. Despite this frequency, however, there is a paucity of data on the use of alcohol among older adults in Africa. International reports tend to focus on adolescents and younger adults, and "adults" are examined as the entire group of people aged 18 and older (3). While the HIV/AIDS epidemic has ravaged much of Africa and reversed previous gains in life expectancy in many countries, the recent expansion of antiretroviral treatment and prevention efforts has conferred stability, and in some cases reduction, in HIV prevalence and incidence for many African states (165). In conjunction with economic progress and development, this means people are maintaining their health and living longer and that the population of older African adults will likely grow.

Drinking alcohol in older age can influence the symptom severity and disease progression of chronic conditions such as cancer and cardiovascular diseases common among older adults (166, 167). Also, different drinking patterns, such as moderate consumption or heavy drinking, can have differential health consequences among middle-aged and older adults relative to younger populations (168, 169). Particularly germane to this group is the

association between moderate consumption and the lower mortality rates largely attributable to improved cardiovascular outcomes (170). Investigations of alcohol use among older adults living in developed settings show different drinking patterns exist among older adults and are associated with various correlates depending on context. A population based study of over 40,000 adults aged 60 and above in the US found 53% of men and 37% of women were current drinkers (171). Also from the US, a prospective cohort study identified a higher likelihood of heavy drinking among men, those who were unmarried and had lower levels of education (172). It has been suggested that drinking decreases with age due to changes in lifestyle and tolerance to alcohol (173, 174), and large surveys in the US have shown that heavy drinking episodes are less prevalent in older adult populations (59, 175). Contrary to this observation, the Danish Health and Morbidity Study included over 11,000 older adults and observed an increase between 1987 and 2003 in heavy drinking from 15.4% to 21.9 % for men and from 6.3% to 15.3% for women (65). A related Danish study identified the strongest increasing trend in the number of heavy drinkers was in the lowest socio-economic groups and those married or cohabiting (176). These findings demonstrate the geographical variations in the prevalence, trends and correlates of drinking among older adults. As the older adult population in Africa grows, information about drinking behavior, its consequences and correlates will be necessary for health care planning and development.

1.6.5 Alcohol policy in Africa

Similar to many other low and middle income countries, the majority of African countries lack a coherent national alcohol policy. Many countries have some actions in place, such as excise taxes, minimum age limits for the serving and purchase of alcoholic beverages and maximum blood alcohol concentrations when driving, but few have adopted alcohol policies at the national level. Among the 45 African countries included in the WHO's Global Report on Alcohol for which there was not a total alcohol ban (i.e. - Mauritania), excise taxes was the most commonly reported alcohol regulation at 91% (3). Less than 50% of these countries had minimum age limits on purchasing alcohol, and only 38% had any regulations for alcohol advertising, promotion and sponsorship. Only recently have some African states begun to develop national alcohol policies, including Malawi, Uganda, Botswana, Kenya and Ghana. There is concern that some of these national policies are heavily guided by vested interests of the alcohol industry. Bakke and Endal analyzed alcohol policy initiatives sponsored by

SABMiller and the International Center for Alcohol Policies (ICAP) for 4 African countries (Lesotho, Malawi, Uganda and Botswana) (177). They identified identical sets of core policy measures and some key formulations across the 4 countries that would ostensibly be favorable to the alcohol industry, such as positions on a 'National Alcohol Committee' and promoting targeted interventions in lieu of population-based measures. At the local level, Matzopoulos and colleagues noted the distribution of funds from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) for a bar-based educational intervention in South Africa to SABMiller (178). The authors called into question the suitability of such funding to a highly profitable industry and the evidence supporting the efficacy of the proposed intervention. There are growing calls for the establishment of an international framework for alcohol, and for national alcohol policies in Africa (153, 179). The populations for which these policies are developed would be best served if they included population-based measures in accordance with evidence-based recommendations and were developed independently of for-profit interests.

2.0 RATIONALE

The clear need for an improved health standard among the African population is an important opportunity to advance global public health, and alcohol use is a vital aspect of this improvement. We initiated this analysis on the understanding that alcohol is an important determinant in a population's health profile, is used differently by sub-groups within a population resulting in differential health effects across sub-groups, and that information about alcohol use among special populations is required for the development of effective public health programs and alcohol policy. Specific to Africa, the theoretical underpinnings are that the diversity of alcohol use across African nations and within populations deserves deeper scrutiny, and the anticipated increase in consumption across demographic groups requires baseline information against which to compare future trends, and design and evaluate programs to mitigate harm. Finally, there is very limited data on alcohol use and its socio-demographic and health-related correlates specifically among African women and older adults, and few international comparative studies of such measures within the African region.

3.0 AIMS

The overall aim of this study was to describe alcohol use among special populations in African nations using publicly available cross-sectional survey data from the World Health Organization. We define alcohol use in terms of patterns of drinking and special populations as adult women at least 18 years of age and older adults of both genders aged 50 and above. The specific aims of this study were:

I. To describe the prevalence of drinking patterns among special populations in several African countries. (Papers I & II)
II. To identify socio-demographic and health-related correlates of drinking patterns among special populations in Africa by country. (Papers I, II & III)
III. To compare the prevalence rates of drinking patterns and the associated correlates between African countries. (Papers I & II)

4.0 MATERIALS AND METHODS

4.1 Overall study design

This work is a secondary analysis of cross-sectional data from two World Health Organization (WHO)-sponsored population-based surveys in Africa – the World Health Survey (WHS) and the Study on global AGEing and adult health (SAGE). Both datasets employed the same probabilistic sampling design to recruit nationally representative samples, and are based on data collected through face-to-face interviews. The information collected from both surveys included demographics, health status, risk factors and health service coverage and utilization. The WHS collected data from 20 countries in Africa between 2002 and 2004, and SAGE from 2 African countries, Ghana and South Africa, between 2007 and 2010. The WHS is a nationally representative sample of the entire adult population, whereas SAGE is a nationally representative sample of the adult population aged 50 and above with a smaller cohort of persons aged 18 to 49. Thus, WHS data was used to address our aims among adult women in 20 African countries and SAGE data among older adults in Ghana and South Africa.

4.2 Country descriptions

4.2.1 WHS participating countries

The WHS included twenty countries on the African continent. Table 1 presents various economic, social and health indicators for each country (180). In total, over 340 million people live in the participating countries. They are geographically spread throughout the continent; including the two island nations Comoros and Mauritius (see Figure 4, Mauritius is east of Madagascar, not shown). Overall, the countries represent resource-poor settings; at least a third of the population of 14 countries is living below the national poverty level. Except for Mauritius, Namibia, South Africa and Tunisia, agriculture dominates labor force. Overall life expectancies range from 49 years in Chad, South Africa and Swaziland to 76 in Morocco, and literacy rates among people aged 15 and over range from 22% in Burkina Faso to 91% in Zimbabwe.

Table 2 shows the use of various alcohol policy measures across the 20 countries (181). All countries except for Mauritania, which has a total ban on alcohol, have excise taxes on beer,

wine and spirits, and only Mali does not have a national legal minimum age for the on or off-premise sale of alcohol. Over half of the countries do not have legally binding regulations on alcohol advertising or product placement, and only one country, Ethiopia, has legally binding regulations on both alcohol sponsorship and sales promotion.

Figure 4. Map of Africa

4.2.2 SAGE participating countries

Ghana

Ghana is located on the west coast of Africa, bordering Cote d'Ivoire to the West, Burkina Faso to the North and Togo to the East. Modern Ghana came about in 1902 as a British colony (182). Colonialism systematically exploited the country's agricultural and mineral resources, and introduced cocoa crops. Ghana became and still is one of the world's leading

Table 1. Population, economic, health and social indicators for the 20 countries in the World Health Survey in the Africa region

Country	Region	Population in 2012 (in 1000s)	GDP per capita in USD in 2011	Percent Agricultural labor share	Percent living below national poverty level	Total fertility rate in 2012 (Children born/women)	Life expectancy at birth of total population in 2012	Physicians per 1000 population	Largest Religion, in percent of total population**	Literacy rate*, in percent of total population
Burkina Faso	Western	17,275	1300	90 (2000 est.)	47 (2009 est.)	6	54	0.06 (2008 est.)	Muslim, 61	22 (2003 est.)
Chad	Central	10,975	1900	80 (2006 est.)	80 (2001 est.)	5	49	0.04 (2004 est.)	Muslim, 53 (1993 est.)	35 (2010 est.)
Comoros	Southern	737	1200	80 (1996 est.)	60 (2002 est.)	4	63	0.15 (2004 est.)	Muslim, 98	75 (2010 est.)
Congo	Central	4,366	4500	NA	NA	6	55	0.10 (2007 est.)	Christian, 50	84 (2003 est.)
Cote d'Ivoire	Western	21,952	1600	68 (2007 est.)	42 (2006 est.)	4	57	0.14 (2008 est.)	Muslim, 39 (2008 est.)	56 (2010 est.)
Ethiopia	Eastern	91,195	1100	85 (2009 est.)	29 (2010 est.)	5	57	0.02 (2007 est.)	Orthodox, 44 (2007 est.)	43 (2003 est.)
Ghana	Western	24,652	3100	56 (2005 est.)	29 (2007 est.)	4	62	0.09 (2009 est.)	Christian, 69 (2000 est.)	67 (2010 est.)
Kenya	Eastern	43,013	1700	75 (2007 est.)	50 (2000 est.)	4	63	0.14 (2002 est.)	Protestant, 45	87 (2010 est.)
Malawi	Southern	16,323	900	90 (2003 est.)	53 (2004 est.)	5	52	0.02 (2008 est.)	Christian, 83 (1998 est.)	75 (2010 est.)
Mali	Western	15,494	1100	80 (2005 est.)	36 (2005 est.)	6	53	0.05 (2008 est.)	Muslim, 90	31 (2010 est.)
Mauritania	Western	3,359	2000	50 (2001 est.)	40 (2004 est.)	4	62	0.13 (2009 est.)	Muslim, 100	58 (2010 est.)
Mauritius	Southern	1,313	15,000	9 (2007 est.)	8 (2006 est.)	2	75	1.06 (2004 est.)	Hindu, 48	89 (2010 est.)
Morocco	Northern	32,309	5100	45 (2006 est.)	15 (2007 est.)	2	76	0.62 (2009 est.)	Muslim, 99	56 (2009 est.)
Namibia	Southern	2,165	7500	16 (2008 est.)	56 (2005 est.)	2	52	0.37 (2007 est.)	Christian, 85	89 (2010 est.)
Senegal	Western	12,969	2000	78 (2007 est.)	54 (2001 est.)	5	60	0.06 (2008 est.)	Muslim, 94	39 (2002 est.)
South Africa	Southern	48,810	11,000	9 (2007 est.)	50 (2000 est.)	2	49	0.77 (2004 est.)	Protestant, 37	86 (2003 est.)
Swaziland	Southern	1,386	5300	70 (2007 est.)	69 (2006 est.)	3	49	2.1 (2006 est.)	Zionist †, 40	82 (2003 est.)
Tunisia	Northern	10,732	9400	18 (2009 est.)	4 (2005 est.)	2	75	1.19 (2009 est.)	Muslim, 98	74 (2004 est.)
Zambia	Southern	13,817	1600	85 (2004 est.)	64 (2006 est.)	6	53	0.06 (2006 est.)	Christian, 62	81 (2003 est.)
Zimbabwe	Southern	12,619	500	66 (1996 est.)	68 (2004 est.)	4	52	0.16 (2004 est.)	Syncretic †, 50	91 (2003 est.)

Source: online CIA World Factbook ISN 1553-8133

*Literacy rate definition: proportion of population age 15 and over who can read and write

**Where no date is presented, no date was given in the Factbook. Dates provided based on Census surveys.

† Zionist is a blend of Christianity and indigenous ancestral worship. Syncretic is part Christian, part indigenous beliefs. NA = Not Available

Table 2. Alcohol policy measures for countries participating in the World Health Survey in the Africa region

Country	Excise tax on beer, wine and spirits	National legal minimum age for on- & off-premise sales of alcohol	Time restrictions for on-&off-premise sales of alcohol (hours & days)	Location restrictions for on- & -off premise sales of alcohol (places & density)	National maximum legal blood alcohol concentration (BAC) when driving, in %	Legally binding regulations on alcohol advertising/product placement	Legally binding regulations on alcohol sponsorship/sales promotion
Burkina Faso	Yes	18	Yes & No	Yes	No	Yes/Yes	No/No
Chad	Yes	18	Yes & No	No	0.08	No/No	No/No
Comoros	Yes	18	No & No	Yes & No	ZT	No/No	No/No
Congo	Yes	18	Yes	Yes	0.08	No/No	No/No
Cote d'Ivoire	Yes	18	No	No	0.08	Yes/Yes	No/No
Ethiopia	Yes	18	No	Yes & No	No	Yes/Yes	Yes/Yes
Ghana	Yes	18	No	Yes & No	0.08	Yes/Yes	No/No
Kenya	Yes	18	Yes	Yes	No	Yes/No	No/No
Malawi	Yes	18	No	No	No	No/No	No/No
Mali	Yes	No	No	No	No	No/No	No/No
Mauritania	Total ban	Total ban	Total ban	Total ban	Total ban	Total ban	Total ban
Mauritius	Yes	18	Yes & No	No	0.05	No/No	NA/No
Morocco	Yes	20	Yes	Yes	NA	Yes/Yes	NA/No
Namibia	Yes	18	Yes	Yes & No	0.08	No/No	No/No
Senegal	Yes	18	Yes & No	Yes & No	No	Yes/No	No/No
South Africa	Yes	18	Yes & No	Yes & No	0.05	No/No	No/No
Swaziland	Yes	18	Yes	Yes	0.05	No/No	No/Yes
Tunisia	Yes	20	Yes	Yes	0.05	No/No	No/No
Zambia	Yes	18	Yes & No	Yes	0.08	No/No	No/No
Zimbabwe	Yes	18	Yes & No	Yes	0.08	No/No	No/No

On-premise refers to the sale of beverage alcohol for consumption at the site of the sale, generally in pubs, bars, cafes, or restaurants.
Off-premise refers to the sale of beverage alcohol for consumption elsewhere (not on the site of sale). Off-premise sales take place, for example, in state monopoly stores, wine shops, supermarkets, and petrol stations or kiosks, depending on local regulations. (World Health Organization, 2004, Global Status Report on Alcohol Policy, p. 15)
ZT = Zero Tolerance NA = No Information
Source: WHO Country profiles, 2011

producers of cacoa. Nationalist activities gained momentum in the 1940s, and independence came in 1957. The new government initiated ambitious economic and social development programs, with significant gains in educational achievement. However, a decline in economic conditions due to a drop in cocoa prices exacerbated existing political and social tension, and a CIA-sponsored coup d'état took place in 1966 and fostered in an era of political instability. Democratic elections did not occur until the end of 1981, and political stability has steadily increased to this day.

Despite the political setbacks of the 20th century, Ghana is ahead of many African countries in its economic, social and cultural achievements. Textile mills and handicrafts, chemical, wood and furniture industries dominate the country's industrial base. Ghanaian universities have produced some of Africa's best graduates, serving all over the world. Kofi Annan is one of the best known members of the diaspora, elected Secretary General of the United Nations in 1997. Most health care is provided by the government, although hospitals and clinics run by religious groups also play an important role. Such hospitals make up approximately a third of Ghana's health service provision (183). Urban areas are well served by health care facilities, while some rural areas have no modern health care, and residents rely either on traditional medicine or travel great distances for treatment. Like many African countries, HIV is present in Ghana, although the estimated prevalence in 2011 of adults aged 15 to 49 is relatively low at 1.5% (184)(UNAIDS). In 2011, the World Bank upgraded Ghana from a "low income" country to an "upper low income" country(185).

South Africa

South Africa is located at the southern tip of the African continent, bordered by Zimbabwe, Botswana, Namibia and Mozambique, and contains the majority of Swaziland within its borders. Cape Town came under British control in 1806, and much of the 19th century was dominated by wars and conflict between indigenous tribes such as the Xhasa and Zulu peoples and the European settlers, including Brits, Dutchmen and Germans (186). In 1910, the Union of South Africa was created as a British dominion, but the Union was effectively granted independence just two decades later. In the late 1940s, the National Party was elected to power and strengthened formal racial segregation begun under Dutch and British colonial rule. South Africa became a Republic in 1961, and furthered legislative actions were

enacted in support of apartheid. Apartheid ushered in the highest standard of living in Africa for the White minority while the Black majority remained disadvantaged by almost every standard. The fall of apartheid began in the 1970s with the first agreements endorsed by both black and white political leaders for a peaceful transition of power and equality for all, and in 1990 the National Party took the first steps towards dismantling institutionalized discrimination. South Africa held its first universal elections in 1994, which the African National Congress, prominent in the resistance movement against apartheid, won by an overwhelming majority. It has been in power ever since. Changes in post-apartheid South Africa have led to high unemployment, mostly among Blacks. The government struggles with achieving the monetary and fiscal discipline to ensure both the redistribution of wealth and economic growth.

Today, South Africa is a multiethnic, multicultural country with 11 official languages (187). While English is the common language in commercial and public life, it is only the fifth most-spoken language at home. Approximately 80% of the population is of black African ancestry comprising a variety of ethnic groups. South Africa also has the largest community of European, Asian and racially mixed ancestry in all of Africa. South Africa is one of the hardest hit countries by the HIV/AIDS epidemic, with a current prevalence rate among adults aged 15 to 49 of 17.3%. Since 2004, anti-retroviral treatment (ART) has been rapidly scaled-up nationally and currently 66% of those in need of treatment are enrolled in ART programs (184). The HIV/AIDS epidemic in South Africa has exacted substantial economic, health and social costs. Gains in life expectancies were diminished, economic growth slowed and a generation of AIDS orphans was produced. Recent data, however, shows the epidemic has plateaued, with incidence below 2% and a relatively stable prevalence over the last four years (188)(UNAIDS, Global aids response progress report 2012). Despite the high unemployment (25%) and about half the population living below the national poverty level, South Africa is the largest economy in Africa, and classified as an upper middle income country (185).

4.3 World Health Survey

4.3.1 Purpose and goals

WHO developed and implemented the World Health Survey to compile comprehensive baseline information on the health of populations and on the outcomes associated with the investment in health systems, and to generate baseline evidence on the way health systems are currently functioning. The WHS objectives were to develop a means of providing low-cost, valid, reliable and cross-culturally comparable information; to build the evidence base to monitor whether health systems are achieving the desired goals; and to provide policy-makers with the evidence they need to adjust their policies, strategies and programs as necessary.

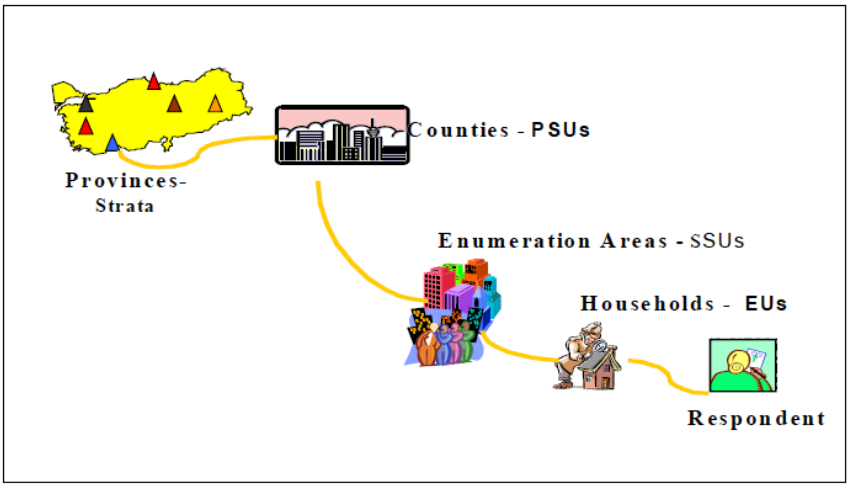
4.3.2 Sampling

The probability sampling employed by the WHO in the WHS was a multistage stratified random cluster sampling design, without replacement and where each stage of selection had a known non-zero probability. Within each country, the *de facto* community-dwelling population (all residents, regardless of citizenship, not hospitalized or imprisoned) was first stratified on factors related to outcomes, epidemiological variables and, most often, geographic and administrative variables (i.e. – by province, urban/rural, north/south, etc.). A hierarchy of clusters was randomly chosen within the strata in the following order: counties, enumeration areas and, finally, households as illustrated in Example I and Figure 5 below. Interviewers selected an individual from the households by compiling a roster of all members, and using a Kish table to randomly identify a respondent from the roster. Kish tables provide a means for each eligible person in a household to have an equal probability of selection into the survey.

Example I. Multi-stage stratified cluster sampling

• Strata:	Provinces	
• Primary Sampling Unit (PSU)	Counties	Multi-stage clusters
• Secondary Sampling Unit (SSU)	Enumeration Areas	
• Elementary Unit (EU)	Households	
• Observation Unit	Persons	

Figure 5. Multi-stage cluster sampling



Source: WHO, WHS Sampling Guidelines

4.3.3 Sample sizes and response rates

Worldwide, the WHS conducted surveys in 71 countries, of which 20 were on the African continent with a total of 77,165 adults aged 18 and above. WHS aimed to enroll approximately 5000 households and individual participants in each country, and reported response rates at both the household and individual level. Of note, the target size was approximately 3000 in Comoros and South Africa, and 4000 in Ivory Coast and Mauritania. Sample sizes ranged from 1761 in Comoros to 5000 in Mauritius, with a median value of 3880 for the 20 participating countries. The denominator for household response rates was the number of households selected, and the numerator the number interviewed. The denominator for individual response rates was the number of individuals selected out of households that agreed to participate in the individual survey and in which an individual was selected via Kish tables, and the numerator the number interviewed. The reasoning behind this computation was that if the household refused to participate in the individual survey then there could be no individual respondent as there was no way to select this individual (i.e. – using Kish tables). The household level response rates ranged from 54% in Swaziland to 98% in Burkina Faso and Comoros, with a median of 90% for all 20 countries. Three countries, Swaziland (54%), Congo (64%) and Senegal (69%), reported household response

rates of less than 70%. In Congo and Ivory Coast, political instability limited the ability to carry out sampling procedures as planned in a proportion of rural households included in the sampling frame. In Comoros, only households on the two largest islands were interviewed. Individual response rates ranged from 85 in one country to 99% in six countries, with a median of 98%. Mali (85%) and Morocco (89%), reported individual response rates of less than 90%.

4.3.4 Instruments

The survey workers conducted both household and individual interviews, and the instruments used are described in detail on the WHO website (189). This work uses data from the individual interviews only, and further only from particular modules within the instrument. We will thus limit the description to the individual interview instrument and relevant modules. The individual questionnaire modules relating to different aspects of demographics, health status, risk factors and health care coverage are each described briefly below.

Demographics assessed included age, gender, weight/height, education, ethnic/cultural group and occupation. The module comprised a total of 15 questions and was administered to all respondents.

The health status module was based on the International Classification of Functioning, Disability and Health, known commonly as ICF. The ICF is the WHO's system for classifying health and health-related domains. These domains are classified from bodily, individual and societal perspectives by means of two lists: a list of body functions and structure, and a list of domains of activity and participation. The health status module contained the following 8 domains of health: mobility, self-care, pain or discomfort, cognition, interpersonal activities, vision, sleep or energy, and affect. It also included overall health status measures querying current self-perceived health and difficulty with daily activities.

The risk factors module aimed to identify certain attributes, characteristics or exposures that increase the likelihood of developing a disease. The 5 topics covered were tobacco, alcohol, nutrition, physical activity and environmental risk factors.

The health care coverage aimed to identify individuals with various health conditions requiring certain health interventions and those who received appropriate interventions. The module covered several areas; for our purposes we utilized the section on the diagnosis of chronic illnesses. The lifetime diagnosis and past-year symptom prevalence for the following illnesses were examined: arthritis, angina, diabetes, asthma, and chronic lung disease.

4.4 SAGE Survey

4.4.1 Purpose and goals

The SAGE survey aimed to compile comprehensive longitudinal information on the health and well-being of adult populations and the ageing process. The primary objectives were to obtain reliable, valid and comparable health, health-related and well-being data over a range of key domains for adult and older adult populations in nationally representative samples; to examine patterns of age-related changes in health and well-being using longitudinal follow-up of a cohort as they age; to supplement and cross-validate self-reported measures of health to improve comparability of self-reported measures; and to collect health examination and biomarker data that improves reliability of morbidity and risk factor data and to objectively monitor the effect of interventions.

4.4.2 Sampling

SAGE employed the same probabilistic sampling design as WHS. In order to oversample adults aged 50 and above under this design, the target sample size for each participating country was 5000 households with at least one person aged 50+ years and 1000 households with an 18 to 49 year old respondent. In the older households, all persons aged 50+ years (for example, spouses and siblings) were invited to participate. SAGE is a longitudinal survey, and at the time we carried out this work only data from Wave I was publicly available and is thus what we included in the materials. The six countries that participated in SAGE were China, India, Mexico, the Russian Federation, Ghana and South Africa.

4.4.3 Sample and response rates

SAGE aimed to enroll approximately 6000 households and individuals from the participating countries. The Ghana sample contained 5092 participants, of which 4289 (84.3%) were aged 50 and above. The South Africa sample contained 4037 participants, of which 3666 (90.9%) were aged 50 and above. Household and individual response rates were calculated in the same way as the WHS. Household response rates for Ghana and South Africa were 86% and 67%, respectively; individual response rates for Ghana and South Africa were 80% and 77%, respectively.

4.4.4 Instrument

Similar to the WHS, SAGE conducted both household and individual surveys, and this work is based on data collected through the individual survey only. Also, the SAGE individual instrument contained all of the modules in the WHS individual instrument as described above. We will thus describe briefly only the unique modules we utilized from the SAGE individual instrument. The full instrument is also available and described in detail on the WHO website (190).

The social cohesion module aimed to collect data relating to the participant's social network. It consisted of 19 questions covering the structural and functional characteristics of their social network (Appendix I). Structural characteristics included size, location, density and homogeneity, and functional characteristics included social support (emotional, instrumental), social connectedness (presence/absence of ties, frequency of participation) and trust.

The social well-being and quality of life module was based on the WHO Quality of Life scale. This scale has been used worldwide and among many populations (191). This instrument used the brief 8-item version and queried participants on their perception of having their energy and monetary needs met for daily living, and their satisfaction with different aspects of life and life overall. These measures are discussed in greater detail in the Measures section below.

4.5 Cross-cultural comparability

One of the primary aims the WHO had in conducting both the WHS and SAGE surveys was to generate health information that would be comparable across nations, populations and cultures. The WHO defined the criteria for comparability in general as conceptual equivalence, reliability, and validity; and for cross-population comparability in particular through the use of the same questions, methodology and measurements of response category cut-points and adjustments for differences. Several steps were taken to ensure they met the goal of comparability. Potential assessments were identified through a rigorous scientific review of existing standard instruments, were then subjected to international consultations with experts, reviewed by key informants at the regional level, and then piloted in 63 countries. The pilot testing was conducted in 43 languages, used cognitive interviews (the application of retrieval techniques to elicit the most accurate recall by making the participant aware of the environment at the time of the event in question), cultural applicability tests for validity (the use of culturally relevant terms, a city block vs. a day of travel), and stringent psychometric tests for reliability. To ensure conceptual equivalence a core set of survey questions was maintained across all countries and an exhaustive translation procedure employed.

4.6 Measures

The measures for this study are those for alcohol use, socio-demographics, health status, quality of life and social engagement. The individual alcohol variables are presented in Table 3, and all measures are described in greater detail below. The individual items on which measures are based are provided in the Risk Factors sections of the WHS and SAGE instruments in Appendix I.

4.6.1 Alcohol use

To address all three aims this analysis used alcohol use as the dependent variable defined as drinking patterns. Both WHS and SAGE instruments included alcohol measurements as recent-recall daily estimation questions, and we constructed drinking pattern variables for each gender based on previously published papers or the guidelines for adult alcohol use from the National Institutes for Alcohol Abuse and Alcoholism (NIAAA) in the US (131). The individual items used to construct each drinking pattern variable are presented in Table 3.

Table 3. Drinking pattern variable definitions and measures

Variable	Definition	Measure	Source	Paper I	Paper II	Paper III
Lifetime abstainer	Never in lifetime consumed an alcoholic drink.	A negative response to "Have you ever consumed a drink that contains alcohol (such as beer, wine, spirits, etc.)?"	SAGE/WHS	X	X	X
Previous drinker	Ever in lifetime consumed an alcoholic drink but not in the last 12 months.	A positive response to lifetime consumption and a null response to "In the last 12 months, how frequently [on how many days] on average have you had at least one alcoholic drink?"	SAGE		X	
12 month drinker	Consumed an alcoholic drink in the last 12 months but not in the last 7 days	A positive response to lifetime consumption and a greater than null response to 12 month frequency of use.	SAGE		X	
Current drinker	Consumed an alcoholic drink in the last 7 days.	A positive response to lifetime consumption and a greater than null response to "During the past 7 days, how many drinks of any alcoholic beverage did you have each day?"	SAGE/WHS	X	X	
Heavy drinker	Consumed a total of at least 15 drinks over previous 7 days.	A positive response to lifetime consumption and consumption of at least 15 drinks over the previous 7 days regardless of number of drinks consumed on a single day.	WHS	X		
Risky single-occasion drinker	Consumed at least 5 alcoholic drinks on any single day of the previous 7 days.	A positive response to lifetime consumption and consumption of at least 5 drinks on at least one day of previous 7, regardless of total number of drinks consumed over 7 day period.	WHS	X		
Low risk drinker – women	Women who had at most 1-2 drinks per day over the last 7 days and no more than 7 in total.	A positive response to lifetime consumption and consumption of between 0-2 drinks per day over the last 7 days and no more than 7 in total.	SAGE		X	X
Low risk drinker - men	Men who had at most 1-2 drinks per day over the last 7 days and no more than 14 in total.	A positive response to lifetime consumption and consumption of between 0-2 drinks per day over the last 7 days and no more than 14 in total.	SAGE		X	X
At risk drinker - women	Women who had at least 4 drinks on one day of the previous 7 or 8 drinks in total.	A positive response to lifetime consumption and consumption of at least 4 drinks on one day of the previous day or 8 drinks in total.	SAGE		X	X
At risk drinker - men	Men who had at least 5 drinks on one dya of the previous 7 or 15 drinks in total.	A positive response to lifetime consumption and consumption of at least 5 drinks on one day of the previous 7 or 15 drinks in total.	SAGE		X	X

Some are based on frequency of any consumption only (lifetime abstainers), others are based on both quantity and timeframe measures. All the drinking pattern variables for Paper I were based on measures identified in the published alcohol literature, and all the drinking pattern variables for Papers II and III were based on NIAAA guidelines for adult alcohol consumption.

Items querying quantity consumed used the term "standard drink". Both WHS and SAGE used a showcard with pictures to illustrate what was meant by a "standard drink", and defined it as containing approximately 10 g of ethanol depending on the country (Appendix II). Additionally, the instruments used local terms for alcohol and the brand names of locally produced commercial beverages.

4.6.2 Sociodemographics

Both WHS and SAGE instruments assessed standard sociodemographic variables. In our analyses we included age, gender, education, working status, ethnicity/tribe, marital status, religious affiliation, and residential status. We created a dichotomous education variable to reflect the receipt of any formal education. We also created a dichotomous variable to reflect if the participant was currently working for pay. Ethnicity/tribe and religious affiliation variables were nominal variables and country-specific. Marital status included cohabitation, so that the dichotomized married/cohabitating variable we constructed reflected both civil status circumstances. Residential status was a dichotomous nominal variable for urban or rural settings.

4.6.3 Health Status

The health status modules of the WHS and SAGE questionnaires queried participants on whether they had ever been given a diagnosis by a health worker for arthritis, angina, diabetes, asthma, or chronic lung disease. They were further queried on the presence over the previous 12 months of symptoms for these disorders, regardless of response to lifetime diagnosis questions. We used algorithms based on criteria from the International Classification of Diseases – 10^{th} Revision (ICD-10) to determine if participants met the diagnostic criteria for each of these disorders. We constructed a dichotomous variable

representing the fulfillment of diagnostic criteria over the previous 12 months for any of the aforementioned chronic illnesses.

4.6.4 Smoking

Both surveys queried participants on their use of tobacco. We constructed a dichotomous variable for current smoking based on a positive response of either “yes, daily” or “yes, but not daily” to the question “do you currently use any tobacco products?”.

4.6.5 Quality of life

The SAGE Survey used the 8-item WHO Quality of Life scale (WHOQOL-8) to measure subjective quality of life. The “quality of life” construct has gained traction in public health research as an important piece of the total package of health as “a state of complete physical, mental, and social well-being not merely the absence of disease…”. The WHO defines Quality of Life as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person’s physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment”. The WHO developed two internationally-applicable and cross-culturally comparable instruments with the aid of 15 collaborating centers worldwide to measure quality of life, the WHOQOL-100 and the WHOQOL-BREF (192). The 8-item version used in the SAGE survey is an abbreviated version of the WHOQOL-BREF developed in the UK and published in 2003 (193). It was designed for use by researchers as a very short and concise quality of life measurement. The developers derived the eight items from the WHOQOL-BREF using structural equation modeling and Rasch modeling. Both the WHOQOL-100 and -BREF versions have demonstrated good discriminant validity, content validity and test-retest reliability. Domain scores produced by the WHOQOL-BREF correlated at around 0.9 with the WHOQOL-100 domain scores. The psychometric properties of the WHOQOL-8 version have not been as rigorously tested as the other two versions have, but it has been translated into several languages and used widely in Europe where population norms have been established. The WHOQOL-BREF has also been used in Africa, and demonstrated good validity and reliability (191).

We calculated a quality of life index score by summing the individual responses where higher responses indicated a higher quality of life. Scores ranged between a minimum of 8 and a maximum of 40 and were normally distributed. We also dichotomized responses into "high" and "low" by collapsing the two highest responses "very satisfied/completely" and "satisfied/mostly" into the "high" category, and the three lowest responses "neither satisfied nor dissatisfied/moderately", "dissatisfied/a little" and "very dissatisfied/none at all" into the "low" category. In the older South African adult sample for which we applied this scale, the Cronbach's alpha of the entire scale was 0.87.

4.6.6 Social engagement

The SAGE survey included measures of social engagement which queried participants on how often they engaged in a particular social activity in the last 12 months. It included 9 questions including attendance at a public meeting discussing local affairs, personally meeting a community leader, attending any group meeting (club, union, society, organization), working with other people in the neighborhood to improve or fix something, having friends visit their home, being in the home of or hosting someone from a different neighborhood, socializing with coworkers outside work, attending religious services, and leaving the house to attend, meetings, activities, visit family or friends . The participant responded to each item according to the response options "never", "once or twice per year", "once or twice per month", "once or twice per week" or "daily". We calculated a social engagement index score by summing the score of the corresponding responses, where higher scores indicated higher social engagement. Scores ranged from a minimum of 9 to a maximum of 45 and were normally distributed. We also dichotomized responses into "regularly" vs. "irregularly", where "regular" participation included monthly, weekly and daily responses, and "irregular" included annual (once or twice per year) or no participation (never). In the older South African adult sample for which we applied this scale, the Cronbach's alpha of the entire scale was 0.76.

4.7 Statistical analysis

By design, multistage stratified random cluster sampling requires weights accounting for the probabilities of selection at each step to ensure the statistics produced from the data are representative of the population. These design weights are necessary since strata were not

always proportionate to one another because they were often based on geographic and administrative variables, or because of purposeful over- or under-sampling of specific cases, as with SAGE for adults 50 and over. Also, to compensate for the common non-response attribute of large surveys among persons with certain characteristics, post-stratification or non-response weights adjusting for this bias are also necessary. The WHO provided these weights as part of the publicly available data files. They calculated design weights based on the probabilities of each sampling unit, and the post-stratification weights are based on UN population estimates for age and gender. We applied these weights to all analysis of both the WHS and the SAGE data sets. We used the Statistical Program R for the K-means clustering analysis and to generate map figures (194), and for all other analysis we used STATA version 11.0 (195).

Upon analysis using the SAGE datasets, we noted a proportion of approximately 10% missing data on the ethnicity and religion variables. As discussed, ethnicity and religion are very relevant to drinking pattern, and a large amount of missing data could bias results towards erroneous findings and conclusions. After further inspection of these variables we noted they were missing at random, that is, the patterns of "missingness" were not correlated with any of the other covariates or any of the dependent drinking pattern variables. Thus, to handle this missing data we used multiple imputation. Multiple imputation is a statistical technique in which the missing values are replaced by several simulated versions of potential values (196). Each of the simulated complete datasets is analyzed using standard methods, and the results are combined to produce estimates and confidence intervals that incorporate missing-data uncertainty. We imputed 10 datasets using multinomial regression models for ethnicity and religion including all independent, dependent and structural sampling variables (i.e. – strata, probability sampling units, weights) in the model. We used the imputed datasets for all the regression models fitted using the SAGE datasets. We used STATA version 11.0 (195), using the survey (svy) and multiple imputation (mi, mi svyset) command structures (197).

In the SAGE datasets for Ghana and South Africa used in Papers II and III, drinking patterns were defined according to "low risk" and "at risk" criteria as described in Table 3 above. Between both countries a total of 100 people reported drinking in the last 7 days but did not

meet the criteria for either low risk or at risk drinking. When analyzed within each country by gender, these groups did not differ significantly on sociodemographics from the low risk drinking group and was thus included in this group for the analysis. Table 4 below shows the numbers of those not meeting "low risk" or "at risk" criteria by gender and country.

Table 4. Frequencies of older adults from SAGE datasets who did not meet "low risk" or "at risk" criteria by country and gender

	Ghana	South Africa	Total
Women	6	8	14
Men	42	44	86
Total	48	52	100

4.7.1 Aim I

To produce estimates of the various drinking patterns we calculated weighted proportions of each drinking pattern. Overall, we reported lifetime abstention and the other frequency-only based alcohol measures (previous drinkers, 12 month drinkers, current drinkers) out of the total sample being examined. The heavy drinkers, risky single-occasion drinkers and low and at risk drinkers we presented out of those who reported drinking in the previous 7 days, unless otherwise noted. We also reported raw absolute numbers for the size of each type of drinking pattern.

4.7.2 Aim II

To identify correlates of drinking patterns we used the Pearson chi-square test of independence in bivariate analysis. To identify correlates of drinking patterns controlling for other covariates we used multivariate logistic regression when the outcome drinking variable was binomial (e.g. yes current drinker/no current drinker) or multinomial regression when the outcome drinking variable included all mutually exclusive drinking patterns (e.g. lifetime abstainer, low risk drinker, at risk drinker). In multinomial regression models we used lifetime abstainers as the reference group. In accordance with convention, we considered a p-value less than 0.05 to signify statistical significance. We did not include in the analysis to identify associated correlates countries with a lifetime abstention rate 95% or above and less than 30 current drinkers.

To explore the non-linear association between age and drinking pattern, we fitted generalized additive models (GAM). GAM allowed us to assess the validity of the linearity assumption in Generalized Linear Models (GLM), e.g. logistic regression. It is a natural extension of GLM allowing for all types of functional relationships between the dependent and the independent variables (198).

4.7.3 Aim III

To compare countries on drinking pattern prevalence rates among women using the WHS data we performed K-means clustering averaging over 25 runs. This technique allowed us to explore whether the 20 countries could be grouped into clusters based on similarities in weighted proportions of the three drinking variables: lifetime abstainers, heavy drinkers and risky single-occasion drinkers. K-means clustering aims to divide a number of observations into a number of clusters where each observation belongs to the cluster with the nearest mean value(s) and the within-cluster variability is at a minimum (199). As with the previous aim, we did not include countries with lifetime abstention rates 95% or above or with 30 or fewer current drinkers.

To compare factors associated with the differences in drinking patterns among older adults in Ghana and South Africa, we fitted logistic regressions among the whole sample for country assignment (Ghana/South Africa) in an age adjusted model first, followed by a model adjusted for additional covariates and a final model that further included smoking.

Also to compare factors associated with drinking patterns between countries among both women and older adults, we calculated and directly compared the frequency of individual factors that were statistically significant or insignificant, and if significant the direction of its association (increase or decrease in likelihood). We also examined the correlates across clusters generated by K-means clustering and geographic location.

In order to observe the effect of gender-specific criteria for drinking pattern on the grouping of the countries in the analysis among women in 20 African countries, we applied the gender-specific criteria for being a “low risk” or “at risk” to the 20 countries in the WHS

dataset. If the gender-specific drinking criteria showed very different categorizations of the individual countries and subsequent groupings, then one or both of the criteria applied could potentially be a poor measure. This is an exercise in methodology, and speaks to the robustness of the results for country groups based on drinking pattern prevalences.
The definition applied in the analysis among women in 20 African countries was the same definition as used in a previous publication by a member of our team using the same WHS dataset but for the entire sample, that is, including men. In contrast, the definitions of drinking patterns used in the analysis for older adults took into account gender differences by employing and they were mutually exclusive. Heavy drinkers and risky-single occasion drinkers were not mutually exclusive, and employed a higher volume consumed as criteria (see Table 3 under Methods). In the interest of completeness, and to explore the effect of applying different definitions of drinking patterns on estimates of prevalence rates and associated factors, we reran the analysis among women from 20 African countries, that is, the statistical analysis employed in Paper I, using the low risk and at risk drinker definitions applied to the women in the older adult analysis.

As in the original analysis, we excluded from the K-means clustering and regression analyses countries reporting a lifetime abstention rate 95% or higher and with fewer than 30 current drinkers. Weighted proportions of low risk and at risk drinking by the remaining 14 countries are presented in Table 6. These results are described under the heading 5.4 *Unpublished results*.

5.0 RESULTS

5.1 Aim I

Lifetime abstention was the most common drinking pattern overall among both adult women in 20 African countries and older adults in Ghana and South Africa. Among women, lifetime abstention rates ranged from 56% in Mauritius to 99% in Comoros. Among older adults, lifetime abstention was 42% in Ghana and 75% in South Africa. Current drinking among women ranged from 30% in Burkina Faso to less than 0.5% in Tunisia, with a median rate of 12% for the 20 countries. Among older adults, the current drinking estimate was 28% in Ghana and 12% in South Africa. Among currently drinking women, rates of heavy drinking varied from 1% in Mauritius to 41% in Chad, and rates of risky single-occasion drinking from less than 0.5% to 58%, also in Mauritius and Chad, respectively. Among currently drinking women overall, risky single-occasion drinking was more common (median 18%) than heavy drinking (median 10%). Among current drinking older adults in Ghana, at risk drinkers comprised 26%, the remaining classified as low risk drinkers. In South Africa, at risk drinkers comprised 37% of currently drinking older adults. Tables presenting prevalence rates for each drinking pattern by country and gender are presented in Papers I and II.

5.2 Aim II

Socio-demographic correlates of current drinking among women across the 14 countries studied included increasing age, having any education, working for pay, being married/cohabitating and living in an urban setting. Increasing age was the most common and consistent correlate associated with being a current drinker across the countries, and this association was non-linear in several countries. The remaining correlates were associated with current drinking in fewer countries, and varied in the direction of the association, for example, of the 5 countries for which having any education was significant, it decreased the odds of being a current drinker except in Chad. Among older adults in Ghana and South Africa, the most common correlates of being any kind of drinker (i.e. – not a lifetime abstainer) included ethnic group, religion and smoking. Being a current smoker was positively associated with all active drinking patterns. Conversely, being Muslim was the

consistent negatively associated correlate of being a drinker among older adults. Quality of life and social engagement were not independently associated with drinking pattern among older adults in either Ghana or South Africa. Further, we identified very few correlates of heavy and risky single-occasion drinking among adult women in any of the countries examined.

Of note, Tables 4 and 5 in Paper II that presented the values for the adjusted associations between correlates and drinking patterns among older adults in Ghana and South Africa is mislabeled. It states odds ratios are presented when in fact the beta coefficients for the correlates from multinomial regression models are presented. Given that odds ratios are simply another mathematical expression of the beta coefficients, the findings of significant correlates and their directionality, which we aimed to identify and compare, remain the same. We did not aim to observe or compare the magnitude of these correlates.

5.3 Aim III

K-means clustering based on rates of lifetime abstention, heavy drinking and risky single-occasion drinking among women from 14 African countries produced four clusters of countries (Figure 1, Paper I). The first cluster included countries with low- to mid-range percentages of lifetime abstainers and few heavy drinkers and risky single-occasion drinkers and was labeled “moderate consumption countries"; the second cluster included countries with a mid- to high-level range of lifetime abstinence and somewhat more heavy drinkers and risky single-occasion drinkers and was labeled “harmful consumption countries"; the third cluster was also made up of countries with a mid- to high-level range of lifetime abstention, but with higher heavy drinker and risky single-occasion drinker rates and thus labeled “hazardous consumption countries"; the fourth and final cluster represented Chad only, which had a mid-level lifetime abstention rate and was a high outlier on the proportion of heavy drinkers and risky single-occasion drinkers. Of the 14 countries included, 4 were in the “moderate consumption” cluster, 5 in the “harmful consumption” cluster and 4 in the “hazardous consumption” cluster.

In comparing the correlates of drinking patterns across the countries among women, there were no consistent patterns in the significance, effect size or direction of the correlates within the country clusters generated by the K-means clustering, or by geography.
In Ghana and South Africa, the correlates of being a low and at risk drinker among older adults varied, with only religion and smoking being consistently associated with the drinking patterns similarly between countries and the genders.

Table 6 in Paper II presenting the results for the analysis to identify which factors might explain differences in drinking patterns between Ghana and South Africa is mislabeled. It states odd ratios are presented when in fact log-odds are presented for the logit regressions. Also, 95% Confidence Intervals should have replaced the standard errors. Unlike with Tables 4 and 5 in Paper II, this has consequences for the interpretation of the results. A table with the revised results followed by an explanation of the results is shown below.

Table 5. Differences in drinking patterns between Ghana and South Africa by gender in models adjusted for 1. age, 2. plus marital status, ethnicity, religion, education, work status , chronic illness <12 months, good self-reported health, 3. plus smoking

	Women		
	Ghana vs. South Africa Model 1	Ghana vs. South Africa Model 2	Ghana vs. South Africa Model 3
Drinking pattern*	OR (95% CI)	OR (95% CI)	OR (95% CI)
Low risk drinker	5.21 (3.53,7.61)	4.10 (2.75,6.11)	5.53 (3.53,8.67)
At risk drinker	2.05 (1.20,3.54)	1.97 (0.71,4.01)	3.78 (1.57,9.21)
	Men		
Low risk drinker	4.95 (3.53,6.96)	6.82 (3.97,11.70)	13.61 (7.92,23.37)
At risk drinker	3.63 (2.53,5.21)	5.75 (3.49,9.49)	11.82 (7.36,19.11)

* Lifetime abstention is the reference for each drinking pattern, and South Africa is the reference country.

As shown in Table 5 above, all the estimates for the drinking types have overlapping confidence intervals between the different models, indicating no significant influence of either sociodemographics or smoking on the association between drinking pattern and country according to this measure. Among women, however, at risk drinking loses statistical significance in model 2 with the addition of sociodemographics. This suggests the association between being an at risk drinker in Ghana vs. South Africa compared to being a lifetime abstainer is partially explained by sociodemographics. The magnitude of the estimate,

however, changes only from 2.05 to 1.97, and the confidence intervals between these values are overlapping. Among men, the estimates for low and at risk drinkers change notably upon the addition of smoking into the model. The wide confidence intervals in Model 3, however, overlap with the estimates from Model 2, indicating the change in estimate is not statistically significant. The wide confidence intervals reduce certainty in the estimate, and likely reflect the small number of at risk drinkers. These results suggest smoking does not explain the differences in drinking pattern among men or women between older adults in Ghana and South Africa, and sociodemographics may provide some explanation for the difference in the proportions of at risk drinkers among older adult women between Ghana and South Africa.

5.4 Unpublished results

Among current drinkers, Mauritius had the highest proportion of low risk drinkers at 97.3%, and Chad had the highest proportion of at risk drinkers at 79.0%. To compare cluster assignment with the original analysis, we generated 4 groups using K-means clustering. The labels we assigned to the four groups are similar although not identical to the original analysis. In Table 6, countries are labeled according to the cluster assignment from both the original and current analysis, and are ordered according to decreasing proportions of at risk drinkers. Ethiopia is an exception in the ordering because the proportion of women identified as at risk drinkers (26.2%) among current drinkers was considerably larger than the proportions identified among current drinkers as heavy (5.3%) and risky single-occasion drinkers (1.8%), and the other countries did not show such differences. In other words, in Ethiopia the at-risk drinker definition included more women who were considered neither heavy nor risky single-occasion drinkers relative to the other countries in the original analysis. The geographical distribution of countries by color-coded drinking cluster is presented in Figure 6.

To identify independent correlates of low risk and at risk drinkers relative to lifetime abstainers we fitted multivariate logistic regression models including the same covariates as used in the original analysis (age, any education, married/cohabitating, working for pay, rural setting) for each low risk/lifetime abstainer and at risk/lifetime abstainer categories.

Table 6. Weighted proportions of low and at risk drinkers among women from 14 African countries

Country	Lifetime abstainers	Low risk drinker %(n)	At risk drinker %(n)	Original analysis consumption label with color	Current analysis consumption label with color
Chad	79.0	21.0 (78)	79.0 (280)	High Hazardous	Hazardous
Zambia	85.8	39.5 (45)	60.5 (70)	Hazardous	Hazardous
Burkina Faso	64.4	40.9 (290)	59.1 (379)	Hazardous	Hazardous
South Africa	82.0	54.9 (84)	45.1 (84)	Hazardous	Harmful
Malawi	92.8	56.9 (23)	43.1 (22)	Hazardous	Harmful
Namibia	69.8	59.7 (292)	40.3 (202)	Harmful	Harmful
Zimbabwe	90.8	64.9 (49)	35.1 (36)	Harmful	Harmful
Congo	59.7	72.2 (173)	27.8 (75)	Harmful	Moderate
Swaziland	92.6	74.9 (38)	25.1 (21)	Harmful	Moderate
Kenya	89.5	78.4 (105)	21.6 (29)	Harmful	Moderate
Ethiopia	64.1	73.8 (336)	26.2 (129)*	Moderate	Moderate
Cote d'Ivoire	73.0	80.4 (116)	19.6 (30)	Moderate	Moderate
Ghana	63.0	80.8 (247)	19.2 (56)	Moderate	Moderate
Mauritius	56.1	97.3 (237)	2.7 (7)	Moderate	Extreme moderate

*Proportion out of sequence due to high proportion of at risk drinkers not identified as either heavy drinkers or risky single-occasion drinkers in original analysis.

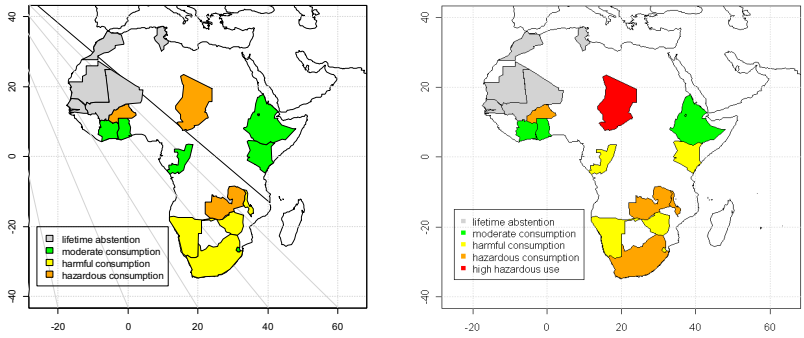
The most commonly associated correlate with low risk drinking compared to lifetime abstention among the 14 countries examined was increasing age, where it was significantly associated in 7of the 14 countries. We observed that having any education was significantly associated with low risk drinking in 4 countries, where it decreased the likelihood of low risk drinking in 3 out of those 4 countries.

Similar to low risk drinking, age was the most commonly associated correlate of at risk drinking relative to lifetime abstention, where it was positively associated in 6 of the 7 countries for which it was significant. Living in a rural setting was positively associated with at risk drinking in 3 of the 5 countries for which it was statistically significant.

We observed no consistent pattern in the significance, effect size or direction of the covariates within the country clusters generated by the K-means clustering, or by geographical region.

Figure 6. Geographical distribution of clusters from K-means clustering analysis using low risk and at risk drinking definitions (Panel A) and heavy drinking and risky single-occasion drinking definitions (Panel B)

Panel A **Panel B**



Note: Both maps are labeled by drinking pattern and countries with high lifetime alcohol abstention. Mauritius and Comoros are small island nations and difficult to observe in such a geographic illustration. Since Mauritius was the only country in the "extreme moderate consumption group" in Panel A, it was not included in the legend.

6.0 DISCUSSION

The main, overall findings of this investigation are a predominance of lifetime abstention among women from 20 African countries and a diversity of drinking patterns among those who do imbibe; low rates of abstention and at risk drinking among older adults in Ghana and high rates of abstention and at risk drinking among older adults in South Africa; and a variety of associated correlates with drinking patterns among women and older adult men and women both within and between countries, where increasing age, religion and smoking are common across states. Comparisons revealed some similarities and many differences in drinking patterns and associated correlates across countries among both adult women and older Ghanaian and South African adults.

6.1 Discussion of methods

The quality of the results of any epidemiologic investigation is contingent on the methods applied in the process of sampling and measurement. Random error can be defined as the lack of precision due to high sampling variability and thus approaches zero as the sample size approaches infinity (93). On the other hand, systematic error, also commonly called bias, is the difference between an observed value and the true value due to all causes other than sampling variability, such as selection and measurement biases (200). For a study to be considered valid, random and systematic errors should be minimal (93). Validity is often divided into the concepts of internal validity and external validity. For descriptive studies such as this, internal validity refers to the accuracy or quality of the study (i.e. – how well the study was run in terms of research design, operational definitions used, how variables were measured, what was/was not measured, etc.), and external validity is the extent to which the results can be generalized to larger populations and contexts outside the study sample (201, 202). The sources of these errors, the actions taken to reduce such errors and the implications of these errors for our results and conclusions are discussed below.

6.1.1 Study Design

The WHS and SAGE Surveys both employed a multistage stratified cluster design based on nationally representative sampling frames to identify the target sample population. Probability sampling is designed to identify a sample representative of the population of interest, in this case, the entire general adult population of a nation (203). Large surveys such as the WHS and SAGE surveys also aim to collect large sample sizes, such that the precision of the estimates derived from these samples is maximized and random error is minimized. The sampling frames, strata, and clusters were defined in a manner to respond to practical challenges, such as recruiting from areas of different population densities (i.e. urban centers vs. rural areas) while maintaining the random selection of participants. These designs are rigorous and well-suited to measuring health and identifying risk factors of populations, however, there are inherent sources of bias in study implementation affecting the veracity of results and conclusions. Additionally, as cross-sectional designs, they do not allow for statements about causality in the relationships observed between independent and dependent variables.

One of the challenges of studying a health behavior uncommon in sub-groups of a population is the relative low frequency of this behavior and subsequent small group sizes. Small group sizes are a concern because they increase the potential for random error, reduce precision and reduce the statistical power to observe significant associations (93). The small group sizes of the different drinking patterns, particularly the “riskier” drinking patterns and especially among women, might suggest applying a different analytical approach to identifying differences between drinkers and abstainers. A case-control design is a common approach for handling rare behaviors or outcomes (204), and could theoretically be applied for studying differences between drinkers and abstainers. As a starting point, the groups to be studied and the “risk factors” of interest should be clearly defined. In a hypothetical study with the overall aim to study the difference in sociodemographic and other health-related factors between drinkers and abstainers, I would suggest defining drinkers as people who drink at bars and clubs, and abstainers as people who go to church and are lifetime abstainers. These represent two distinct groups where contrasts may be stark and readily identified. Drinkers, or “cases”, could be sampled from randomly selected community-based bars or clubs, and lifetime abstainers, or “controls”,

could be sampled from randomly-selected local churches in the same areas as where the "cases" were sampled from. This would ensure the same source population between cases and controls. Cases and control could be matched on age, and people sampled from churches who did report drinking would be excluded. I would also stratify by gender to control for gender-specific differences in drinking and observe gender-specific "risk factors" for drinking patterns. Comparisons to observe differences in the frequencies, or "risk", of sociodemographics or other health-related indicators could then be carried out using chi-square tests of independence. Conditional logistic regression could be used to identify factors independently associated with being a drinker or abstainer in matched samples (204). The benefits of a case-control design are its relative low-cost to implement, rapid data collection and applicability to a rare outcome, in our case drinking. However, in the above hypothetical study, carrying out surveys at bars is precarious because of the high potential for selection, response and measurement bias. One of the limitations of a case-control design is they cannot be used to compute rates of outcome occurrence in the population at risk, but only the relative rates between those with and without a particular risk factor (93). A population-based case-control design would allow for the estimation of outcome occurrence, but isn't feasible for studying differences in alcohol use (i.e. – absence of national registries that record individual-level alcohol use). So a case-control design as described above would not have allowed us to estimate prevalence as we aimed to do. Also, because of how cases are sampled, case-control designs are not widely representative and will have limited generalizability. The cases and controls in this example represent only segments of all "drinkers" and "non-drinkers"; not all drinkers will go out to bars, and not all abstainers will be church-goers. Similarly, there may be important differences between, for example, drinkers at bars and drinkers at home - women may be more likely to drink at home than at bars, so that mostly men would be included in a such a sample. Overall, the differences observed between drinkers at bars and abstaining church goers may be rather different than the differences between other types of drinkers and abstainers. I would contend that a case-control design is of some value in assessing differences between drinkers and abstainers if the aim is to understand differences at a community level, and of limited value if the aim is to understand differences between representative groups of drinkers and abstainers.

6.1.2 Selection bias

Even with a large, well-defined and randomly selected target sample, other problems can introduce error into the sample actually collected. Selection bias has been defined as "distortions that result from procedures used to select subjects and from factors that influence participation in the study" (205). One way selection bias can be introduced is through a low response rate, that is, a low proportion of eligible individuals who participate in the survey. Another way is response bias, such that persons with a particular characteristic systematically decline participation. Generally, response rates upwards of 80% are considered satisfactory for epidemiological studies (206).

Response rates

In the WHS, the response rates for the individual surveys on which this work was based ranged from 85% to 99% with a median of 98%. In SAGE, individual response rates for Ghana and South Africa were 80% and 77%, respectively. The WHS response rates are quite high, and the SAGE response rates are reasonably good, indicating low selection bias. However, as presented in the methods sections, the individual response rate calculations were dependent on the household rate. Considering that every household interviewed theoretically contained an eligible participant even if they hadn't been selected via Kish tables, we could argue the individual response rate denominator should have been either the number of households selected or the number of households interviewed. For all participating countries the number of individuals selected was lower than either the households selected or households interviewed, so that such alternative computations using these values would have lowered the individual response rates. None of the WHS response rates, however, would have been lowered below 80% (data not shown).

Most of the participating countries were very near their target sample size for individuals, which varied from 3000 to 5000 per country, and ranged from 1750 in Comoros to 5287 in Malawi with a median of 3880 participants. In conjunction with the household and individual response rates given by the WHS for each African state, values are generally high and within recommended values for "good" response rates. Still, the different possibilities for response rate computations introduced potential for lower actual response rates and thus selection bias.

Response bias

Many surveys have encountered response bias where the response rate is higher for women compared to men (207). In the case of both the WHS and SAGE surveys, the application of post-stratification weights based on UN population estimates for age and gender helped correct for disparities due to response bias on these characteristics (208). Plausibly, however, response rates may vary by other characteristics and may be different for different countries, and this would introduce response bias which has not been corrected for. Furthermore, the material contained no information about the non-responders, so we are unable to make any statements about who comprised this group and how they may have differed from the respondents. This would have indicated to what extent the collected sample may have represented a more select group than a truly nationally representative one.

6.1.3 Measurement bias

When a response in a survey differs from the true value, measurement error has occurred (203). When the response tends to differ from the true value systematically, there is measurement or information bias, threatening the internal validity of the study. The WHS and SAGE surveys collected measurements at the individual level using standardized survey instruments during face-to-face interviews. Establishing the quality of a measurement are the properties of validity and reliability (204). Reliability refers to the reproducibility of an empirical measure, and validity is the degree to which the measurement is useful, or actually measures the concept it intends to. Reliability is a necessary condition for validity, but not sufficient enough on its own to guarantee validity. The WHO developed the survey instrument using well-validated assessments and established criteria (e.g. - the ICF, Quality of Life scale, ICD-10) in conjunction with broad expert input and review, strict interviewer training and follow-up, and wide pilot testing on the ground. These actions all aim to increase internal validity by reducing measurement error and bias, and many studies have demonstrated their capacity to do so (209). Nonetheless, the collection of survey data using questionnaires has inherent problems that can contribute to measurement error, including construct validity, reliability, recall, social desirability, and interviewer techniques.

Arguably the most important measures in this investigation are the questions regarding alcohol use, and the definitions and criteria we applied in constructing our drinking pattern variables. These questions are also likely the most "loaded" as they touch upon all the issues mentioned above, and also issues of stigma, religion, gender, understanding and, in the case of cross-national comparisons, consistency and comparability. I will thus focus the discussion of these measurement issues on the alcohol measures used in the survey and the variables we constructed, and briefly and similarly discuss other covariates of interest.

Alcohol measures

As previously discussed, there are many ways of measuring alcohol consumption and drinking patterns, and many studies have examined the strengths and weaknesses of various techniques (210-212). The WHS and SAGE surveys used recent-recall daily estimation self-reports based on the "standard drink" metric obtained through face-to-face, home-based interviews. Using these self-reports we constructed variables to reflect different drinking patterns, using criteria based on the literature and American guidelines for adult alcohol consumption. Generally, alcohol self-reports demonstrate adequate reliability and validity when interview circumstances are structured to minimize bias (211). Current discussions thus center on factors that affect veracity (e.g. – units of measurement, timeframe) and the processes that underlie response behavior (e.g. – social desirability) (212).

The "standard drink" metric

One of the most salient characteristics in terms of reliability of the measures used in our material is the concept of a "standard drink". Both surveys defined a standard drink as either a 330cl bottle of beer, a 180cl glass of wine or a 30cl shot of liquor, and containing approximately 10g of ethanol. One of the sources of variation reducing the reliability of this metric is the variation in alcohol content within types of alcohol, for example, the percent alcohol by volume for beer between 4% and 9%. Another is the volume of beverage consumed, since actual beer sizes, glasses and shots poured often vary widely according to when, where and how they are being taken (213). Indeed, in some countries in Africa, Uganda for example, consuming alcohol from a communal container is still practiced, particularly in rural settings (214). The ubiquity of the nomenclature of "drinks" is another way the definition of a standard drink can also vary between environments and affect

understanding and thus reliability. In many African countries, social drinking at public establishments where "standard drinks" are consumed is much more common in urban than rural settings (109, 126). Systematic variation in the definition of a standard drink can also occur within other common demographics, such as gender through the mechanisms of beverage preference and size, location of consumption and intended effects of drinking. Thus, self-reports of standard drinks from urban centers may be more reliable and valid than from rural areas. All of these issues reduce the reproducibility of this measure across different populations and countries, and thus reduce its validity. Variation in the definition of a standard drink means the actual amount of ethanol consumed would vary widely even given the same number of standard drinks reportedly consumed. This in turn affects the drinking pattern constructs, which are based on the number of standard drinks and assume an association between amount of ethanol consumed and level of risk. Thus, the different definitions of a standard drink between people would result in the misclassification of persons according to our drinking pattern construct criteria, reducing the validity of these categories. The extent to which the variation in standard drink definition differed systematically between countries and/or subgroups was not ascertained, and while the surveys attempted to standardize the concept of a "drink" between countries with explanation and pictorials, the influence of systematic variation cannot be completely removed. We thus have no way of controlling for their effects or describing in which direction they may have influenced our observations. As noted above, however, validity is contingent on other considerations. Commercially produced alcoholic beverages are highly standardized in their alcohol content and volume, securing the validity of a "330cl bottle of beer". This standardization can be extended to the alcohol content of mass-produced wine and spirits, even though the volume consumed of these beverages in particular are subject to differences in serving. The use of a showcard by the interviewer depicting pictorials of what a standard drink meant in terms of a bottle of beer, glass of wine and shot of spirit further ensured the validity of this metric in this study (Appendix II). Despite the variations in strength and serving sizes, the concept of an alcoholic beverage is commonplace, and most of the time alcohol is consumed in some kind of drinking vessel. While other ways of measuring the effect of alcohol use exist and could be used as proxy measures of consumption (e.g. – extent of intoxication), no other self-report measure exists for quantifying the volume of alcohol consumed. I would therefore acknowledge the many

limitations in the reliability and validity of the standard drink as the unit of measurement, and how it compromises the accuracy and precision of our drinking pattern categories. I would also state the efforts made to equitably convey the meaning and purpose of the standard drink metric make it sufficiently valid to produce reasonably accurate measures of alcohol consumption and to be used as a basis for patterns of drinking.

Time frame of alcohol use

Another important issue in measuring alcohol use is the timeframe. It is important for both recall bias and observing consumption over time. In alcohol research the widely acknowledged bias in recall is the underestimation of amount consumed, although there is evidence to the contrary among certain populations, for example, American males in college (215). An under-reporting of alcohol consumed is due partly to social desirability and partly to memory retrieval. Reasonably and as has been well documented, events that occurred more recently are more easily and accurately retrieved than those that occurred more distally (216). In this investigation, the survey ascertained the number of drinks consumed on each day of the previous seven days. In general, questions with a defined time-frame have been shown to produce more accurate behavioral assessments than global questions, such as questions about "typical" or "usual" drinking behavior (217). A seven-day time frame increases the likelihood of accurate recall and thus the accuracy of the resulting estimates. On the other hand, it may be limited in representing the general drinking pattern of the respondent. Indeed, the issue of within person variability in alcohol use over time is one of the most persistent in discussions of the validity of quantity-frequency and daily estimation measures of a short timeframe (212). Moreover, variability tends to increase with higher average quantities consumed (218). Researchers have addressed this problem by applying the graduated frequency (GF) approach, where questions measure consumption in terms of graded amounts (e.g. the number or proportion of occasions on which one to two drinks were consumed, three to four, etc.) (219). No such questions were included in the current surveys. However, if we assume that the overall rate of a particular drinking pattern, for example risky single-occasion drinking, will be stable between individuals at a given point in time, estimates of risky single-occasion drinking in a randomly selected sample should be reasonably accurate of the actual population frequency of risky single-occasion drinking even given within-person variability. This would mean the estimates are accurate but the

identification of individual factors associated with risky single-occasion drinking may be hindered, since the characteristics of the individuals engaging in risky single-occasion drinking at any given point may vary. In other words, more heterogeneity within this group would weaken our ability to observe significant associations. This would mean we potentially did not identify certain factors as associated with a particular drinking pattern where they would have been identified if the drinking pattern criteria were more precise and the groups were thus more homogenous. It might also imply that the associations we did identify as statistically significant could potentially be more robust associations since they were identified despite within group variation, or it may be an association common to people across different drinking patterns. The open-ended framing of the questions regarding number of drinks per day at least allowed for the observation of within person variability in consumption over the preceding week. However, using a seven-day time frame to identify what we termed "current drinkers" is limiting. If we assume the term "current drinker" is intended to identify someone who during the time surrounding the interview imbibed on a regular basis, whether weekly or monthly but with regularity nonetheless, a short time frame would miss people who drink less frequently than weekly. A current drinker definition based on a wider time frame, such as the last 30 days, would result in a higher estimate of "current drinkers". Similarly, the estimates of heavy drinking and risky-single occasion would also likely be higher with a wider time frame. Conversely, the low risk group might decrease relative to the at risk group, since more people would likely have been identified who had met the criteria for the at risk group. I would therefore consider the seven-day timeframe adequate for ensuring reliability and validity, limited in identifying variable drinking over a larger time frame, and appropriate for identifying current drinkers and as a basis for defining a person's current drinking behavior.

While not operating under a specified timeframe per se, the question ascertaining lifetime abstention requires the respondent to think back over their lifespan and provide a definitive answer. Recall can certainly play a role in reducing the ability to remember a single or the few drinks had sporadically, which is historically more common in many African countries at gatherings such as weddings or birthdays (110), especially if it occurred during a certain period during the lifespan well in the past. Arguably, misclassifying persons who have in fact ever consumed alcohol but never did so regularly may not significantly alter either the

estimate of what is actually “lifetime abstention” or the identification of factors associated with lifetime alcohol abstinence. On the other hand, however, persons who imbibe infrequently but regularly over the course of their lives certainly do not fit the definition of lifetime abstainers and may indeed inflate the estimate and introduce variability into the lifetime abstention group which would reduce our ability to accurately identify correlates. Furthermore, the survey contained no follow-up questions if the respondent reported never having a drink, increasing the likelihood for misclassification. A study by Rehm and colleagues investigating the validity and stability of self-reported lifetime abstention across surveys administered at 3 time points as part of the US National Alcohol Survey observed more than half (52.9%) of the respondents who reported lifetime abstention at the third time point reported consumption in the earlier surveys (220). As with our material, lifetime abstention was established using only one measurement. While not immediately generalizable to our material of African individuals across several states, these findings support the potential for reduced reliability and validity of a lifetime abstention category based on a single measurement, calls for multiple measurements of this drinking pattern and study of the reliability and stability of lifetime abstention in an African context. Overall, recall bias in this study likely contributed to the overestimates of lifetime abstention, aided by other influences such as social desirability.

Social desirability

As mentioned, social desirability is an important source of measurement bias in measuring alcohol use and patterns of drinking. Social desirability in this instance would lead to a systematic underreporting of drinks consumed in an effort to conform to the assumed ideal of “healthy” drinking or social expectations. In Africa in particular, the denial of any consumption ever (i.e. – lifetime abstinence) may have been systematically over-reported given the historically high rates of abstention (221). This is particularly relevant for women, as often in African countries they are expected not to imbibe due to cultural tradition or gender norms (110). As an example, in South Africa, Gumede coined the phrase “kitchen cupboard drinking” to describe married women he studied in rural Johannesburg who hid their alcohol consumption from their husbands by hiding the alcohol in the kitchen cupboard (222). Similarly, Muslims in particular may avoid reporting any consumption even if it is sporadic and of low quantities, either in their lifetime or currently, as alcohol is strictly

prohibited by Islamic doctrine (221). Anonymity and confidentiality can enhance the validity of self-reported alcohol consumption by reducing the perceived probability of negative judgment or consequences (223). In this material, the data was anonymous and collected by a single interviewer in as private a space as possible in the respondent's home in an attempt to reduce such concerns. Nevertheless, the willingness to response truthfully is a potential source of selection bias that likely contributed to overestimates of lifetime abstention and low risk drinking, and underestimates of heavy, at risk and risky single-occasion drinking.

Interview techniques

The WHS and SAGE surveys took broad measures to ensure the quality of the information obtained during the interviews to reduce measurement bias (detailed descriptions are available at the WHO website) (189, 190). One of the ways they did this was by training the interviewers to elicit the most accurate responses possible. They provided standardized, in-depth training to interviewers on using a standardized instrument and conducting face-to-face interviews about health and healthcare. They also conducted follow-up on interviewer's progress and implementation in the field. Despite these efforts, variability between interviewers would inevitability occur, and this would have resulted in varying quality of information between different interviewers. We did not have any information about differences across the interviewers within or between countries, so were unfortunately unable to account for such differences.

Homebrew

One of the limitations of the questions used to assess alcohol consumption is the total lack of any query about homebrew. As previously described, estimates of homebrew consumption in Africa were approximately 50% in 2004, comprising a considerable proportion of alcohol consumption (3). While commercial breweries continue to expand in Africa, homebrew is still an important source of alcohol, particularly in rural areas (138). Homebrew is very difficult to quantify in the same way as a standard drink since the alcohol content is unknown and there is no standard for volume consumed. Homebrews can range from sorghum beer with a relatively low alcohol content of approximately 2%, to distilled spirits with a context as high as 44% (224). Applying the additional dimensions of regularity of alcohol use and the extent of intoxication as suggested by Room and Makela may be of

particular utility in settings with a high frequency of homebrew consumption since they do not require a standardized unit of measurement (13). Indeed, questions about intoxication have been applied to HIV studies conducted in beerhalls in Zimbabwe, although they were not evaluated against validated alcohol measures (225). While issues of subjectivity (i.e. – definition of intoxication or being "drunk") and cross-cultural comparability may arise with these measures, they would provide some measure of homebrew use and add another axis upon which to observe and understand drinking patterns. For this study I would contend the absence of any measure results in lower estimates of overall consumption, potentially results in overlooking persons who consume solely homebrew, may result in misclassification of persons as low or at risk drinkers, or miss risky-single occasion drinking if homebrew consumption is part of the alcohol consumed and not tallied.

Drinking pattern constructs

Despite alcohol's ubiquity, there are no internationally accepted operational standards for "heavy", "binge" or even "low risk" drinking. Nonetheless, drinking patterns such as these are a common method of defining alcohol use as it is ostensibly consumed in reality.
The criteria we used to define low risk, at risk, heavy and risky single-occasion drinkers were based on algorithms of the number of standard drinks consumed over a specified time period. We constructed the low risk and at risk drinking patterns based on guidelines for adult alcohol use from the NIAAA, which states that "men who drink more than 4 standard drinks in a day (or more than 14 per week) and women who drink more than 3 in a day (or more than 7 per week) are at increased risk for alcohol-related problems". These guidelines are based on the large, nationally representative National Epidemiologic Survey on Alcohol and Related Conditions in the US, and an investigation which showed strong associations between exceeding these daily and weekly limits and the increased risk of alcohol use disorders (226).

The idea of applying different standards to men and women is rooted in the differential biological and behavioral effects of alcohol between the genders (227, 228) as described in the Introduction, and is an important consideration when aiming for the accurate measurement of drinking behavior. The goal in adjusting for gender in alcohol measures is to ensure accuracy in alcohol measurements and interpretation of findings (58). The challenge

is in identifying and quantifying these differences adequately for mathematical adjustment, and taking all relevant differences into account as appropriate. Body water volume is readily measurable for use in an adjustment formula, whereas other metabolic processes are not. Moreover, Graham and colleagues argue a gender adjustment for biological reasons assumes gender equivalency in the social aspects of alcohol consumption, and there is substantial evidence to the contrary. The review by Graham further suggests adjustments for gender differences are relevant when studying the short and long term physiological effects of alcohol use (e.g. immune function, liver disease), and less so when studying outcomes that may be moderated by behavioral gender differences (e.g. alcohol-related traffic accidents). Graham and colleagues also note that further work is needed to understand at what consumption levels and patterns of drinking body water adjustment is necessary, suggesting that "an adjustment formula is likely to be much more relevant for heavy versus light drinkers". In contrast to Graham's review, a study by Stockwell and colleagues found the risk of alcohol-related injury was elevated at all levels of consumption controlling for setting, activity and drinking habits (229). Currently, there is variety in national guidelines for "low risk" and "risky" drinking, and many include gender-specific recommendations (230). Recently, Australia and Canada came forward with different approaches for developing national guidelines. Australia based their recommendations on absolute lifetime risk and estimated drinking levels that would increase lifetime risk of early death, injury or illness to more than 1% (231). Canada, on the other hand, based their evaluation on the relative risk of such outcomes for different levels of consumption compared to the risk experienced by abstainers (232). A relative risk takes into consideration the starting point or baseline risk and estimates the increase in risk, as opposed to the absolute risk, which results in different guidelines for men and women because the pre-existing risk is different, where men are more likely to take risks whether intoxicated or sober. In Room and Rehm's comments about the relative risk approach they state "To base guidelines on relative risks means that men are allowed more absolute risk due to drinking than women; men's riskier behavior while sober results in their being granted a bonus level of alcohol-related risk beyond that for women in a guideline based on relative risk" (231). Stockwell's comment about the absolute risk approach states "An absolute risk can also generate counterintuitive outcomes – for example, implying it to be safer for women to drink larger amounts than men because men are already at a higher level of risk for a range of intentional and unintentional injuries"

(232) As is clearly exemplified by the conflicting evidence and approaches and many unanswered questions regarding gender differences in biological and socio-cultural influences on drinking, the use of different consumption thresholds for men and women remains affably controversial and as yet unresolved.

In this work I did not use gender specific criteria for Paper I, in part because I wanted to be consistent with a previously published paper from our group, and in part because it was consistent with some of the literature on alcohol use among women (69, 233). The unpublished results were motivated by the desire to see how a gender-adjusted measure would compare to the unadjusted measure. For Papers II and III I did use gender-specific criteria because I was concerned with an accurate measurement for "risky" drinking behavior when making a direct comparison to men. As Graham noted, a higher blood alcohol level among women after one drink compared to men may hold little meaning for the risk of alcohol-related harm (58)(although Stockwell's study suggests women are at a higher risk at even low levels of consumption(229)); the higher blood alcohol level, and the time to reach it, after several drinks implies an entirely different level of blood alcohol concentration and therefore alcohol-related risk. If we assume there are no gender differences, or that the gender difference in metabolism and drinking habits cancel each other out, and apply the same criteria to men and women, then if there are in fact gender differences where women are at a greater risk of physiological, psychological and/or alcohol-related injuries than men at lower quantities, then categorizing them as risky drinkers by the same criteria would underestimate the proportion of those actually engaging in risky drinking behavior. I deemed it preferable to err towards a conservative estimate; I would rather overestimate the proportion of women who are engaging in risky drinking behavior, underestimate the proportion of women engaging in moderate or low risk behavior, than the reverse. I chose to use gender specific criteria because the evidence to not adjust is inconclusive, and there is a paucity of data on risk according to different quantities of alcohol consumed and patterns of use in Africa to give empirical support for or against gender-specific criteria. I also chose to do this because of a preference to err towards a reasonably conservative, albeit potentially imprecise, estimate of low and at risk drinking.

The heavy and risky single-occasion drinking categories we constructed were based on criteria from the literature and the 2009 Clausen paper which used the same WHS datasets and so as to be comparable (135). We defined heavy drinking as the consumption of 15 or more drinks over the previous 7 days, regardless of amount consumed per day, and risky single-occasion drinking as 5 or more drinks on any single day, regardless of total amount consumed over the 7 day period. These categories by definition are not mutually exclusive. The risky single-occasion drinking definitions vary in the literature both on the cut-off for number of "standard drinks" consumed (e.g. five or more, six or more, etc.) and the duration of the occasion (e.g. such as "over a day" or "in one drinking session"). The cut-off of five drinks per day has been applied to women previously and showed good validity as a measure of drinking with the increased risk of acute injury or long-term harm (33, 234), although four drinks or less per occasion is increasingly more common (235, 236). However, the timeframe of "a day" does not take into account the possibility for alcohol consumption at different points during the day rather than consumption all at once, and these situations will differ by cultural and social norms and have varying consequences for inebriation and risk of harm. As discussed above in the "standard drink" metric section, the variability of the "standard drink" construct confers variability on all the drinking pattern measures and reduces their reliability and comparability.

Discussions of the cross-cultural applicability of alcohol measures and drinking patterns between developed and developing countries often focus on the salient issue of the circumstances affecting the operationalization of the unit of measurement, such as the local familiarity with commercial alcoholic beverages and the practicalities of homebrew use (i.e. – communal serving bowls, alcohol content, etc.) (237, 238). These are important concerns that have a direct impact on the comparability of alcohol use across cultures given the inherent variations in alcohol commercialization and homebrew use across states. Another pertinent issue is the application of drinking guidelines developed in one cultural setting for use in another. In the case of the NIAAA guidelines used in this work, they were based on data representing the national US population which is markedly different on a host of sociological and cultural dimensions than African countries. It is then reasonable to postulate that these criteria may not be as valid or reliable in many African settings and further, given the diversity of cultures within Africa, would vary in its validity and reliability across the

region, reducing the comparative utility of our drinking pattern definitions. In summary, taking all together the issues of variability in the standard drink metric, recall bias, social desirability, and no homebrew queries, it is very likely lifetime abstention and low risk drinking estimates among both women and older adults are overestimated, whereas heavy drinking, risky single-occasion drinking and at risk drinking are underestimated. The consequences of underestimating the quantity consumed for the "risky" drinking patterns may be that the number of people who would have met the criteria to be classified as such drinkers would have increased, and those who already met these criteria may have consumed more than reported. The margin of over- and underestimation is impossible to quantify, as are country-specific propensities that would introduce bias between countries. While the estimates themselves may be of limited reliability and validity, the comparability between countries is acceptable given that the same measures were applied across all countries. Overall, given that the WHS and SAGE survey's purpose for including alcohol measures was to identify it as a risk factor for disease development, and the efforts made to standardize these measures across countries, enhance recall and capture past week variability, I would contend these measures to be reasonably valid, reliable and befitting our study's aims while acknowledging the limitations in time frame, the standard drink metric and our construction of drinking pattern categories.

Demographics

Generally, demographic information can be collected with high confidence in its reliability and validity, such as gender, urban or rural residence, ethnicity and religion. In an African context, an exception may be age. In discussing how to define "older adult" the WHO has noted that it can be difficult to ascertain age because persons do not have records of the exact date they were born (239). This is especially salient in a rural context. Since one of our major groups of interest was defined by age, that is, adults aged 50 and above, we acknowledge the potential for misclassification, particularly at the lower limit for inclusion. The distribution of age among older adults was normal; however, suggesting the risk of inadvertently including people below 50 in the 50+ group was limited.

Chronic illness

The accuracy and precision of the measurement of chronic illness may have been influenced by recall as it was defined over both the lifespan and the previous 12 months. Further, as is well-known, health care services are lacking in many of the African nations included, and the likelihood of a formal medical diagnosis even when a disease is present is minimal. The lifetime prevalence of the chronic illnesses queried is thus very likely an underestimation. Fortunately, regardless of response to the lifetime diagnosis question, all respondents were queried on the presence of symptoms over the last 12 months, and this is what we used in our analysis. While the reported symptoms are subject to issues of recall and understanding, the breadth of symptoms covered and application of algorithms based on diagnostic ICD-10 criteria strengthens the validity of the presence of a chronic illness over the previous 12 months.

Quality of life

The developers of the WHOQOL instruments conducted an exhaustive process to ensure the equivalence of this instrument across cultures (191), and even independent researchers commend them on their efforts and assert that the WHOQOL would be more likely produce reliable and valid interpretations relative to other measures (240). As a critique, Bowden and colleagues state that it applies an imposed concept of health and requires more psychometric evaluation. Indeed, the version employed in this material has not been rigorously validated both in general and in Africa in particular. The good psychometric performance of the earlier, longer versions of the WHOQOL in Africa on which the WHOQOL-8 is based lends some credence that this instrument is able to identify quality of life in Africa. However, since it was not itself validated, this reduces the construct validity of this instrument in this context, which could be related to the lack of any meaningful differences observed between the different drinking patterns in this sample. We calculated a Cronbach's alpha of 0.87, suggesting reasonably good internal validity of this scale in this sample. I would conclude the WHOQOL-8 is a valid and reliable assessment of quality of life, although its specific psychometric properties and population norms should be further investigated overall and especially in Africa.

Social engagement

The measures of social engagement included questions of how often participants engaged in a particular social activity over the last 12 months. These questions individually and collectively have not been validated, but rather developed as part of the SAGE survey. The concept of "social engagement" as we have applied it is the participation in social activities, where "social activity" is operationalized as community events, time with friends, meetings, etc., and in this study was measured as the frequency of engagement in such activities. A potential source of error in the validity of this measurement is the exclusion of certain social activities, or what may be considered a "social activity", and how this might vary over different populations (e.g. – urban vs. rural). The reliability of the measure is subject to recall bias, as its timeframe is over the previous 12 months, and social desirability towards inflated frequencies of engagement if there is a positive perception of social activity. In this sample, the Cronbach's alpha of the entire scale was 0.76, suggesting good internal reliability. As measures of frequency of social engagement, I would consider these items and our application as continuous and dichotomous constructs valid and reliable, and suggest further work scrutinize the validity of these assessments in various cultural settings, including Africa.

6.1.4 Confounding

Confounding is the situation when an independent variable is associated with an external variable which is also associated with the dependent variable (93). The external variable is known as the confounder. Ignoring a confounder can lead to biased results. Confounders are taken into account through their measurement in data collection and inclusion in statistical analysis, either through stratification or inclusion in statistical tests and models.

In this study we accounted for the confounding introduced by gender through stratification. This method is widely regarded as a standard method for controlling for categorical or dichotomous confounders (93). The other potential confounders we included in our analysis were age, religion, ethnicity, education, working for pay, urban/rural status, having a chronic illness over the last 12 months and currently smoking. Previous studies have identified these factors to be associated with drinking pattern and with each other to different degrees (40, 61, 64, 235). These covariates were controlled for through multivariate regression models, also a standard means of statistically controlling for potential confounding.

Socio-economic status as measured through income is often associated with drinking pattern through a variety of mechanisms. The data available to us did not include an individual or household income measure. We attempted proxy measures of income available via the working for pay variable, although this construct does not necessarily measure funds directly available to the individual and is as such limited. Income is potentially associated with all the covariates named above in addition to the dependent variable of drinking pattern, and thus the lack of a measure of income may have contributed to confounding in our analysis. It may also be the case that unmeasured variables could have contributed to confounding, such as ease of access to alcohol or the drinking behavior of one's social network.

6.1.5 Cross-cultural comparisons

Cross-cultural comparisons of health behaviors and associated risk factors are complicated due to issues of language, conceptual equivalence, understanding and cultural relevance. Often times making such comparisons means sacrificing some local validity for the sake of broad, international comparisons. While the WHO made exemplary efforts to develop instruments worthy of cross-cultural comparisons, it is important to acknowledge that these comparisons are inherently limited in painting precise pictures of individual states, but rather suited to providing overviews and observations of general patterns.

A framework for our comparisons was the labeling of clusters according to a "moderate", "harmful" or "hazardous" drinking category. It is arguable that these categories are analogous to the wet/dry dichotomy described earlier. While we did not take per capita consumption into account, we did measure different drinking patterns, including lifetime abstention; I would assert that this could be a useful way to organize a basic understanding of alcohol use in Africa. I would further contend, however, that additional dimensions such as level of intoxication, type of alcohol consumed and regularity of drinking are required for a nuanced and ultimately more accurate picture of drinking typology. It is noteworthy that since drinking cultures are often defined based on per capita consumption or drinking pattern estimates based on population-based samples, they similarly presume applicability to an entire national population and are discussed accordingly. It is likely, however, that a variety of drinking cultures exist within a national population (14), particularly a large and ethnically diverse one. One should thus keep in the mind the generalizing nature of the

concepts of drinking cultures and the possibility for a varied drinking culture typology even within nation states.

As noted in the introduction, Bloomfield asserts the importance of taking drinking culture into account when measuring alcohol use and making comparisons between countries (87). In this work, we observed and labeled the overall drinking pattern of the population of older adults in Ghana as "moderate" and in South Africa as "hazardous". As a moderate drinking culture where lifetime abstention was low and current consumption was very common with over a quarter having consumed in the last 7 days, we could infer alcohol use is an integrated part of the culture and its use is not associated with a lot of stigma. Thus, estimates might be more accurate and valid in Ghana since social desirability for a socially sanctioned response (i.e. – little alcohol use) would be minimized. Conversely, estimates might be less accurate in South Africa where abstention was relatively high and risky single-occasion drinking common. Additionally, the media has of late regularly reported on problem alcohol use among pregnant women leading to fetal alcohol syndrome and the debate around banning alcohol advertising (241, 242), which may further the social desirability to report underestimates of alcohol use. This mechanism for reducing reliability and validity of the alcohol measures is also applicable to the analysis among African women, where potentially the country clusters labeled "high hazardous", "hazardous" and "harmful" may have had differential self-reports relative to the "moderate" consumption countries. Unfortunately, since we have no information on the extent to which self-reports may have been underestimated or differed between countries we cannot adjust for these differences.

6.1.6 External Validity

The extent to which the results of an investigation can be generalized to larger populations and contexts outside the study sample is the external validity of the investigation. A representative sample would have good external validity to generate results generalizable to the population from which it was drawn (203). In this material, the probability sampling employed and adjustment for response bias with post-stratification weights were means of ensuring the external validity of this sample. Some of the threats to the external validity of this material are the potentially lower individual response rates for the WHS if an alternative response rate calculation had been employed, the individual response rate below 80% in the

SAGE Survey for South Africa, and the lower household response rates in Ivory Coast, Congo and Swaziland in WHS. The response rate denominators in both surveys included households/individuals with whom contact was unsuccessful. No contact could have occurred because the person did not answer the door even if at home, or the person was truly not at home at the time. People may not have been in their homes because they were working, socializing outside the home or engaged in other activities. Persons not answering the door when home may have done so due to such problems as social anxiety, drinking problems or physical health problems. Similarly, refusal to participate in the survey may be more common among persons with particular demographic or health characteristics. Both such situations would introduce selection bias into the sample by systematically excluding persons with particular traits and limiting the generalizability of the findings. Since we have no information on non-responders, we are unable to identify who these persons are, which would have allowed us to appropriately narrow the group to whom the results are generalizable.

Another issue relating to external validity is what populations and contexts the results are being generalized to. Strictly speaking, findings are generalizable only to the population from which the sample was collected and the results derived. Often, however, "populations" can be expanded. In this work, these populations could include persons living in resource poor settings, Africans, women and older adults. In the most liberal perspective, this work would be generalizable to female and older adult populations in resource-poor settings worldwide. Conservatively, only the national populations of women and older adults from which the samples were collected are fit to be generalized to. My inclination is to err on the side of conservative generalizations. Specifically this means that the results are most reasonably generalized to the female and older adult populations of the participating African states, particularly individual estimates of drinking patterns. That being said, expanding these generalizations to other African countries as arguments to investigate drinking patterns or as suggestions for what patterns and correlates to study is appropriate. Expanding beyond Africa seems tenuous given the inherent cultural differences between African and other developing states, especially in light of the diversity observed just within Africa. The utility of survey data such as the WHS and SAGE collected is to provide accurate point estimates for annual prevalence rates and surveillance over time so that trends can be accurately

identified, to observe broad international similarities and differences in drinking patterns and correlates of populations, and provide opportunities to examine sub-groups in larger numbers than may otherwise be feasible. Prevalence estimates are valid only for the point in time which they are estimated and may to varying extents be affected by measurement biases and temporal changes, but associations between factors and drinking patterns may be more robust measures and less affected by such biases and fluctuations over time such as, for example, the relationship between gender and drinking. Overall, given the sampling design, statistical adjustments for response bias, and good response rates, I would conclude the estimates of drinking patterns and the observed correlates are reasonably accurate, with good external validity to the general populations of the respective participating countries and fit for international comparisons.

6.2 Discussion of findings

6.2.1 Aim I

We observed that the majority of African women overall and within individual states subscribe to a drinking pattern of lifetime abstention. This is consistent with historical accounts of alcohol abstention among African women (109) and recent reports (243). High rates of lifetime abstention among African women are likely the results of cultural tradition, adherence to religious doctrines, politics and gender roles, consistent with the model of social determinants of health (38). Moreover, among those who did imbibe, moderate drinking was most common.

Alcohol use overall is widely expected to increase in Africa, and among women in particular (244, 245). As an “alcohol naïve” group making up half the population, they represent an untapped market for alcohol consumption as acknowledge by both the alcohol industry (164) and public health experts (246). If alcohol consumption by women thus increases as is anticipated in the coming years, this predominance of current abstention presents an opportunity to introduce and establish healthy drinking habits among the vast majority of African women. Also, the gender-focused promotion of healthy drinking habits could potentially serve as a vehicle for female empowerment and self-efficacy, especially given reports that drinking can be viewed as a way of participating in “modern living” and “upper

class" behavior (164, 247). Since average volume consumed and pattern of drinking both contribute to the burden of disease, maintaining drinking patterns with limited disease burden would mitigate the possible negative health consequences of greater average consumption (14). Moreover, in Europe, the pattern of drinking in a population has been shown to be stable over time even when total consumption varies (248). If also true in Africa, we could expect the effect of establishing healthy drinking patterns now to have a positive and long-lasting effect on the future public health of African states.

In the majority of countries with sufficient numbers of current drinkers to estimate heavy and risky single-occasion drinking, we observed higher proportions of risky single-occasion drinking relative to heavy drinking. These were particularly high among women in Chad, Burkina Faso, Malawi and South Africa. These estimates are consistent with other WHO reports based on different data, which have noted high rates of heavy drinking in these countries (10). Chad and Burkina Faso have also experienced recent increases in total consumption at the population level, consistent with total consumption theory's postulate of concomitant increases in per capita consumption and problem drinkers (3). There have already been calls from the WHO for Africa to address the harmful use of alcohol (249), and concerns from South Africa and Uganda about the hazardous drinking habits among women in regards to Fetal Alcohol Syndrome and risky sexual behavior (158, 250). Studies have documented a decreased likelihood among women to seek treatment compared to their male counterparts, and qualitative studies have noted the feelings of guilt and shame due to the gender-focused social structure and expectations which may very well make the experience of having an alcohol use disorder worse for African women than men (127, 251). The specific circumstances and consequences of heavy and risky single-occasion drinking in the different countries should be investigated quantitatively and qualitatively for the development of effective interventions, as well as continued surveillance for the monitoring of trends.

Among older adults in Ghana, lifetime abstention was low at 42%, current drinking was common and low risk drinking high and at risk drinking low among those who did imbibe. Taken together, this pattern of drinking is consistent with previous reports labeling Ghana as a "moderate" drinking culture in the general population (10), and extends this pattern to the

community of older adults. The lifetime abstention rate is lower among older adults compared to a general population estimate of 58%, which is also consistent with a moderate drinking culture that tolerates alcohol use, and with observations of increased likelihood of use with age in some European settings (60). Some studies have shown a positive association between moderate consumption and healthy ageing (170). No such investigations have been carried out in a resource-poor setting, and it would be useful for understanding the robustness and breadth of this phenomenon to observe if such an association could also be observed in a resource-limited setting such as Ghana.

Among older adults in South Africa we estimated a high rate of lifetime abstinence among older adults in South Africa, low rates of current drinking, and high rates of at risk drinking among current drinkers. This is in agreement with reports noting a "hazardous" consumption pattern in the general population of South Africa and extends the overall pattern into the older adult community. Lifetime abstention among older adults in South Africa is comparable to the general population estimate, 75% and 71%, respectively. This suggests some stability in drinking habits with age in this context, which may be in part due to the "all or nothing" drinking behavior associated with the overall pattern of hazardous drinking. South African women in general have a known history of harmful use as demonstrated by high rates of Fetal Alcohol Syndrome (252), and the proportion of women accounting for alcohol-related injuries is substantial (253). It would be informative to observe when the risky drinking behavior we observed in older women began to manifest to target prevention interventions. What the consequences of this behavior are long-term and into older adulthood also needs to be further investigated, as does the potential for the prevention of such a high proportion of risky behavior through interventions at younger ages.

Older adults make up a large portion of current drinkers in these countries, so it is not unexpected that their specific drinking patterns mirror that of the general population. Given the social change both the South African and Ghanaian societies have undergone in the last half of the 20th century, it is difficult to state how much the drinking behavior of the older segments of the population represent habits of the past and the adoption of new behaviors. I would speculate it is a combination of the two, varying across and within states.

Considering the drinking pattern prevalence rates we observed among both women from 20 African countries and older adults from Ghana and South Africa, and the consistency with current available information, I would conclude that alcohol consumption in the vast majority of African states is currently dominated by middle-aged men. I would further conclude this domination of alcohol use by men does not preclude the use of alcohol among women, and older women, nor the use in potentially harmful patterns, such as high weekly volumes or risky single-occasion drinking. This could also add speculative support to the idea that an increase in total consumption in many African countries will likely encompass a broad demographic. The presence and, in some cases, high frequency of heavy drinking and risky single-occasion drinking is of particular importance given these drinking patterns' negative impact on health. Non-communicable diseases are increasing in Africa and this trend is expected to continue as economic development is established and accelerates (167, 254). The associations between risky single-occasion drinking and cardiovascular disease and depression are of particular relevance given that both disorders already contribute substantially to the burden of disease in Africa (255, 256). Furthermore, the association between alcohol and increased risk of HIV infection and progression to AIDS is also salient as large swaths of Africa have been devastated by the HIV/AIDS epidemic and continue to struggle with high prevalence and incidence rates (257).

6.2.2 Aim II

Overall, the correlates associated with the various drinking patterns among women and older adults varied, with some notable exceptions. While we might have expected to observe more consistency across the countries in terms of correlates of drinking behaviors under some of the socio-cultural concepts underlying gender differences in alcohol use, it is not so unexpected when we consider the social determinants of health model. The overarching general socio-economic, cultural and environmental conditions that influence health varies widely between and potentially within countries. The differences at this level might make it such that the socio-demographics that may be relevant to drinking behavior in one context might not be observed in another, even when gender differences in alcohol use persist in these places and operate under similar mechanisms.

Among women in the 14 countries analyzed, older age was significantly associated with current drinking in 8 countries, and the relationship was non-linear in 5 of these countries. This association potentially reflects higher levels of independence and authority conferred by older age, and the non-linearity is consistent with the idea of changes in drinking behavior over the lifespan, where drinking increases as age increases and then stabilizes or decreases around mid-life. This dynamic association indicates the opportunity for prevention interventions among younger age groups.

Having any education reduced the likelihood of current drinking among women in four of the five countries for which it was statistically significant save Chad. This finding is in contrast to studies from Europe which observe an association between higher levels of education and drinking among women (163, 258). Also, a recent study from the GENACIS project using data from both high and low income countries showed an association between lower educational attainment and alcohol problems while controlling for drinking patterns (70). However, our measure of *any* education in Africa is likely not directly comparable to measures of educational attainment in high income countries, since education in Africa is not as ubiquitous or consistent, particularly for women. Also, our measure of "current drinking" as a binary measure of use only over the past week is not necessarily commensurate with problem drinking. An increased likelihood of being a lifetime abstainer versus a current drinker due to any education may imply a drinking pattern associated with knowledge of alcohol's potential harms, or a culture of abstinence among those who are able to receive any education. Women receiving any education in Africa likely represent a different demographic than those receiving any or higher education in a Western context.

Working for pay was significantly associated with an increase in current drinking in Mauritius, Chad and Ghana. Not being married or cohabitating increased the likelihood of current drinking for four of the five countries for which it was statistically significant. Having one's own disposable income and being single have been identified as factors in women's alcohol consumption in resource rich and resource poor settings (122, 161), and these factors may become more common and pertinent with economic development (259).

Overall, there were few widespread consistent patterns of associations between sociodemographic factors and drinking patterns among women across the countries or within the country clusters. This emphasizes the importance of local, tailored alcohol assessments in each country to ensure relevance and utility of identified correlates for health planning. The significantly associated correlates we did observe are consistent with previous reports, and lend verification to what is being observed in other studies. Finally, the finding of very few correlates for heavy and risky single-occasion drinking possibly reflect the small sizes of these groups, reducing our ability to observe meaningful associations, or an artifact of the construction of our correlates. In either case, these groups in particular deserve closer scrutiny to identify which basic characteristics and potentially modifiable factors are associated with harmful drinking patterns among African women.

Among older adults in Ghana, subscribing to the primal indigenous religion reduced the likelihood of being a drinker among women and increased the likelihood among men. This association could be interpreted as participation in traditional gender roles around alcohol use, where women brewed alcoholic beverages but did not imbibe and men were the consumers (109). Being Muslim was strongly associated with lifetime abstinence for both older adult men and women, and this is consistent with previous findings in Ghana and the doctrine of Islam. Currently working and being educated were associated with at risk drinking among men and not women. This finding is consistent with a report by Blunch and Blunch which reported average per capita community expenditures as well as cultural factors to be associated with any alcohol consumption in male- and female-headed households, although the association between economy and consumption was stronger in male-headed households (260).

Among older adults in South Africa, being a member of the primal indigenous religion reduced the likelihood of being a drinker among women and increased the likelihood among men. While distinct culturally and geographically from Ghana, this finding may also be explained by adherence to traditional gender roles entrenched in indigenous religions (109, 126). Also, as expected, being Muslim was associated with no active drinking pattern. Among older adult women in South Africa, being a 12 month or low risk drinker was associated with having received any education. Similar to the finding of any education being associated with

lifetime abstention among women in 4 African countries, this finding may similarly reflect the effect of having knowledge of alcohol's potential harms or other, unobserved factors associated with education in this context, such as the drinking habits of one's family and social network. Among South African men, being Coloured or Indian/Asian was negatively associated with being a risk drinker relative to being Black. This is consistent with other reports demonstrating higher rates of drinking among Blacks in South Africa, and generally low rates of alcohol use and alcohol problems among Asians in South Africa (62).

Among both older adult South African men and women we observed no significant variation of quality of life or social engagement when controlling for other covariates. Supporting the local validity of this finding is a recent study from South Africa among outpatients that reported no association between alcohol use disorders and health-related quality of life(261). Reports of a higher quality of life among moderate, current drinkers compared to former drinkers, abstainers or high consumers suggests an inverse U-shaped relationship between quality of life and alcohol use (82-84). While the differences in this study were not statistically significant, the trend was a linear decline with increasing alcohol use from lifetime abstainers to at risk drinkers among men, and virtually no change among women. This equivocally suggests the inverse U-shaped relationship is not currently relevant in this context.

A potential explanation for the lack of an association between quality of life and drinking pattern is that the development and recognition of negative consequences of heavy alcohol use among older adults in South Africa may not yet have fully manifested. Using nationally representative data from the National Epidemiological Survey on Alcohol and Related Conditions (NESARC), Falk and colleagues calculated lag times between the onset of a primary alcohol abuse diagnosis to a mood or anxiety disorder that ranged from 9 to 16 years (262). Similarly, the four-stage model of the cigarette epidemic describes the delay between the adoption of a risky health behavior (smoking) and its effect on health at the population level as occurring over decades (263). Alcohol use is an acknowledged problem in South Africa with documented harms among specific populations (i.e. – blacks, public drinkers, women at risk for HIV) (252, 264, 265) and at the population level (266). Still, lifetime abstention rates are high and South Africa is an expanding economy with growing

economic gains for a wide demographic that will likely confer greater access to alcohol. The American NESARC data was taken from a population with a fairly stable drinking pattern and was based on diagnoses rather than use, so that the lag time observed might not be directly applicable with alcohol use measures in the culturally and economically divergent South African context where alcohol consumption is dynamic. The four-stage model of the cigarette epidemic may be a more relevant model given the increasing rather than stable nature of alcohol use at this time in South Africa. The effects of problem alcohol use as measured by quality of life may thus not manifest until a later time in South Africa. Alternatively, assuming the WHOQOL-8 item scale is of sound validity in this context, quality of life may simply not be a relevant factor for problem consumption based on cultural and social norms, or the small sample sizes of at risk drinking may have precluded the ability to observe a meaningful association.

We identified current smoking for both genders among older adults in both Ghana and South Africa as a positive correlate of all active drinking patterns. Smoking represents an important correlate as it is modifiable and associated with the growing epidemic of non-communicable diseases in Africa (256). Smoking is also of particular concern among older adults who may already be experiencing health problems that could be exacerbated by smoking, or which may increase the risk of developing a related health disorder (267). The health consequences of smoking alone are well known, and most people who smoke do so regularly and meet criteria for dependence (268). Alcohol use, on the other hand, is used in moderation by the majority of those who imbibe, while a smaller proportion goes on to develop a dependence disorder. If alcohol use, and in particular heavy drinking, becomes more common and smoking is a common habit of these drinkers, the negative health consequences of smoking at the population level might develop more rapidly than if current drinkers remained low or moderate drinking dominated. Other large surveys have identified smoking as a correlate of harmful drinking among middle-aged and older adults (267) and there are concerns about the growing consumer market in Africa for the tobacco industry (269). A recent study from Ghana reported an increase in alcohol use and decrease in smoking between 2003 and 2008 in the general population attributable to a national healthy lifestyle program (270). However, it did not investigate the association between the two

behaviors. If indeed smoking continues to decline in Ghana, it will be informative to observe if the decline occurs similarly among drinkers.

6.2.3 Aim III

One of the ways we aimed to compare the drinking pattern prevalence rates among African women by country was to observe if and how they could be grouped together based on their respective rates of lifetime abstention, heavy and risky-single occasion drinking. Overall, the 4 clusters of countries we derived and classified as “moderate consumption”, “harmful consumption” and “hazardous consumption”, with Chad in a position on its own, show that combinations of drinking patterns were similar between some countries, different combinations of drinking patterns were also present among female drinkers in Africa and a diversity of drinking patterns is common across imbibing women on the African continent. Also, the geographic spread and lack of consistently associated correlates within the clusters provide further evidence of the significance of local culture and social context. While there may be similar rates of a single drinking pattern between clusters, rates of the other drinking measures may be quite different, and these differences would have implications for differential risks and divergent national and regional alcohol policies and interventions. The countries with the highest lifetime abstention rates, which were excluded from the cluster analysis, are located in the northern part of Africa and are predominantly Muslim. These results are consistent with other studies and the Islamic doctrine (10, 135). However, this does not apply to all the countries with high lifetime abstention rates, e.g. Zimbabwe or Malawi; these countries are neither predominantly Muslim nor located in northern Africa.

In comparing drinking patterns and correlates among older adults between Ghana and South Africa, we generally observe a contrast of overall drinking pattern where older adults in Ghana show a more “moderate” drinking pattern and South Africa a more “hazardous” pattern. The differences in sociodemographic correlates of the different drinking patterns between Ghana and South Africa likely reflect differences in national cultures in general and the cultures around drinking in particular, and this was equivocally supported by our finding that sociodemographics in part explained the difference in the proportions of at risk drinkers among older adult women between Ghana and South Africa. That this finding was observed only among older at risk drinking women may speak to the generally lower social status of

women and their vulnerability to social changes. It may be fruitful to explore which sociodemographics most contribute to the difference in drinking pattern between Ghanaian and South African women, and how they are associated with one another, especially as Ghana continues up the scale of economic development.

In comparing South Africa and Ghana from the perspective of national economic development, where Ghana is relatively lower on the scale of development, on the surface the findings suggest drinking patterns may change among older adults in Ghana with economic gains. Specifically, an overall increase in at risk drinking may occur, particularly among women. Higher alcohol-related DALYs have been documented in countries at higher levels of development, and among the higher socio-economic groups within lower income countries (4, 271). On the other hand, the associations within each country of proxy measures of economic environment, namely working for pay and being educated, with drinking pattern were few and inconsistent. Furthermore, these factors in conjunction with other sociodemographics contributed little to the relationship between drinking pattern and country assignment, suggesting economic differences at this stage of development between Ghana and South Africa may not directly influence differences in drinking behavior. Moreover, we observed cultural components such as religion and tribal affiliation as consistently associated with drinking patterns within each country, suggesting culture plays a stronger role than economy. There is also evidence asserting stability in drinking patterns over time even when total consumption varies, so while drinking overall may increase, the adoption of "risky" drinking among one particular group may not necessarily follow (248). However, the breadth and depth of social, political and economic change rapidly underway in Ghana (recently upgraded to middle from low income country status)(185) and other parts of Africa questions the applicability of this Western model in an African context. Willis argues there is no clear evidence of a general "drinking crisis" in Africa, and that a change to "modern" drinking may not necessarily be worse than pre-colonial habits; although he does note gaps in our knowledge of current drinking in Africa and the evidence showing risky drinking patterns in several parts of the region (272). It is generally anticipated that social and economic change will mediate increases in alcohol consumption across populations, such that the dynamics of drinking behavior may change or become more apparent than observed here. Thus, surveillance of alcohol consumption should be monitored as Ghana

and other emerging African economies move through stages of economic development to better understand the influence of development on drinking habits in the context of culture and other health behaviors.

6.2.4 Unpublished results

The starkest differences between this repeat analysis and the original k-means clustering analysis based on proportions of lifetime abstainers, heavy drinkers and risky single-occasion drinkers is the identification of Mauritius versus Chad as the "outlier" country, and the movement of all countries to a category of less risky alcohol consumption. I would understand this change as being the result of the mutual exclusivity of the low risk and at risk drinking categories, as opposed to the not mutually exclusive categories of heavy drinking and risky single-occasion drinking. Being mutually exclusive lowered the values of low and at risk drinking relative to heavy and risky single-occasion drinking, such that the mean centers of the clusters were "pulled down". Unlike heavy and risky single-occasion drinking, low and at risk drinking did not contribute to the inflation of one another in the same way. Generally, the assignment of countries to the groups remained the same, save for the movement of already borderline countries. I would believe this supports the robustness of all the drinking pattern categories applied and that drinking patterns can be mostly accurately observed and a country's overall pattern of use identified even with the use of different drinking pattern definitions.

Many of the factors we identified as significantly associated with low risk drinking among women compared to lifetime abstainers were similar to those identified for current drinkers in the original analysis. This may be because the current drinking group is dominated by moderate drinking patterns, that is, low risk drinking as we defined it in the follow-up analysis.

6.2.5 Concluding remarks

The main findings of this work are a diversity of drinking patterns and associated correlates among women and older adults across countries in Africa. The predominance of alcohol abstinence among African women in general persists, while the observation of harmful drinking behavior in several African states among imbibing women is cause for concern and

public health action. Older African adults imbibe similarly to the general population, and their drinking habits deserve attention for the potential positive and negative consequences of alcohol consumption and the growing size of this segment of the population. Socio-cultural components such as religion and tribal affiliation are important correlates of drinking behavior among both African women and older adults, whereas individual economic variables seemed less relevant overall. In conjunction with the sheer variety of correlates observed and lack of a clear pattern across countries, this highlights the influence of socio-cultural factors even in a changing economic environment. Finally, smoking is an important modifiable concomitant health behavior of drinking among older adults in Ghana and South Africa, including harmful drinking patterns, and this is important knowledge for attempts at reducing both problem drinking and smoking.

There are many methodological limitations in cross-cultural alcohol research and in using survey data that suggest the exact figures should interpreted with caution. Nonetheless, the rigors of the surveys' design and implementation lend credibility to the estimates produced and associations identified. The tendency to reflect on Africa as a uniform region is unfounded given the growing body of evidence demonstrating the various typologies of drinking behavior to which this work contributes.

6.3 Discussion of implications

Several implications arise from this work. First, the diversity of drinking patterns and associated correlates observed contributes to the understanding that the epidemiology of alcohol use in Africa is a widely varied landscape across countries, and that this variation extends to women and older adults. In applying this epidemiological knowledge to alcohol policy, our findings suggest countries need individual, tailored national alcohol policies. That being said, I would state that any country where alcohol is not banned outright would benefit from a government-developed national alcohol policy ensuring standard regulations for the production, distribution, sale and purchase of alcohol. These could include, for example, excise taxes, minimum purchasing age, maximum blood alcohol level while driving, and restrictions on time and place for alcohol purchase, which many, but not all, African countries have in place. Such an action is supported by the theory of the collectivity of drinking cultures as a way to limit total average consumption of the population and thus the

proportion of heavy drinkers. I would also state that another vital piece of information in developing alcohol policy is on the type and distribution of alcohol-related harm among drinkers. Alcohol-related problems associated with heavy drinking, risky single occasion drinking or in alcohol use disorders are described in some African countries, such as South Africa (167) and Uganda (273), but less is known about the levels of alcohol-related harm among those with lower average consumption in particular, and among the whole population of drinkers in general. In crafting alcohol policies in light of the prevention paradox, it would be useful to know the distribution of alcohol-related harm to observe if the prevention paradox holds in an African context, and to help decide how to allocate resources between population-based and high risk strategies. The allocation of funds for the prevention of alcohol-related problems is particularly relevant for resource-poor countries. If we assume the prevention paradox in alcohol use is applicable in Africa, it would follow that countries with a low rate of lifetime abstinence, high rate of moderate drinking and low rate of at risk drinking would benefit most from broad based policies targeting the population. This could include some of the measures mentioned above, if not already enacted, or an increase in the stringency or enforcement of these measures if they already are and the society is interested in lowering total consumption. In this work, Ghana, Cote d'Ivoire and Mauritius would qualify as candidates for this strategy. In countries with a high rate of lifetime abstention, low rate of moderate consumption and high rate of at risk drinking, both population-based and high-risk strategies would be beneficial. The countries from this work that could be candidates for this approach would be South Africa, Chad and Burkina Faso. . In addition to national alcohol policies, given that alcohol is rather common in many African states and the various drinking patterns that exist among those who do imbibe, Africa as a region (or sub-regions within Africa) could develop a regional framework for addressing various aspects of alcohol use at the population level. These could include the production and distribution of homebrew and illegally produced artisanal alcohol and the enforcement of alcohol regulations on drinking age minimums and availability, in addition to general and technical support for the development of alcohol policies in the region. Also, while overall the correlates of drinking patterns varied between countries, the consistently identified correlates religion and smoking present another common point of departure to address the potential clustering of lifestyle factors important for health.

A second implication of this work is the opportunity presented by the high rates of abstention among women and among older adults in South Africa. This opportunity was discussed above among women but is also applicable to the general populations of many African states given the high national rates of alcohol abstinence and current marketing efforts from the alcohol industry aimed at the general population. Some market economists have argued that consumer advertising does not increase the prevalence of consumption of a particular product because the market is often already saturated with said product, so that advertising functions as an introduction to improved products rather than as an impetus for uptake (274). While this may be relevant to developed country settings, this is clearly not applicable to resource-poor settings, such as in many African countries, where the high alcohol abstention rates indicate an unsaturated market. Alcohol advertising is highly prevalent in some African countries, such as Uganda and Nigeria, and concerns have already been voiced about the impact of alcohol advertising on alcohol consumption overall and among youth in particular (164, 275). If alcohol advertising does indeed lead to an increase in per capita consumption, the current overall situation of high abstinence could be seen as a window of opportunity to develop and apply measures that could instill healthy drinking behaviors among African women and older adults in particular and national populations in general. Furthermore, starting such actions now could act to mitigate the potential harm resulting from the current levels of harmful drinking.

A third implication of this work is the utility of secondary analysis on publicly available data to investigate alcohol use in special populations. Large surveys are demanding to implement but provide excellent material for determining estimates and observations of relationships between socio-demographic factors and health behaviors. Since alcohol use can be limited and varied in special populations, the large sample sizes of such surveys allow for the observation of less common yet important drinking patterns such as risky single-occasion drinking among sub-groups. Moreover, given the current global economic downturn, funding for alcohol research is likely to remain stable or decrease, thus limiting resources to carry out such comprehensive investigations. Although the WHS and SAGE surveys were not designed specifically for alcohol research, this work helps demonstrate the possibility of using such data to produce useful information for alcohol epidemiology among special populations.

A final implication of this work is the attention drawn to the special populations we investigated, namely women and older adults. While more attention is rightfully being given to these groups in developed countries, there is much less attention focused on these groups in developing countries. To deepen and expand the knowledge base for the epidemiology of alcohol use in Africa, many perspectives should be taken into account, and the drinking behavior of these groups is one such perspective. Furthermore, women and older adults make up sizable proportions of the population in general and it is important that knowledge of their drinking behaviors be documented so as to be included in national and local alcohol policies and public health initiatives.

7.0 FUTURE RESEARCH

As has been alluded to above, more research is required to better our understanding of alcohol epidemiology in Africa, both among special populations and overall. Such research could include investigations into the context of drinking in Africa. For example, what type of alcohol is being consumed, where, with whom and under what circumstances. This is especially relevant given the likely changes in drinking behavior and attitudes towards alcohol underway in many parts of Africa.

As has been demonstrated in previous work, the consequences of drinking behavior can vary due to environment. In many countries but historically mainly in southern European and Mediterranean states, alcohol is consumed with meals and this behavior has been associated with decreased risk of disease and injury (12) . This type of drinking behavior may be limited in some resource-poor settings where alcohol may be widely available but food insecurity common, potentially removing a “buffer” to the detrimental effects of increasing total alcohol consumption. Thus, measures of the immediate social and economic environments should as much as possible be included in future investigations of alcohol use.

As mentioned above, information about the distribution of alcohol-related harms in countries with different distributions of drinking patterns would be useful for deciding on population prevention strategies. Specifically, observing if the prevention paradox and the second-order prevention paradox are applicable in African settings would advance both the universality of the theory and have practical applications. Another aspect of harm that would be useful and interesting to investigate is the experience and distribution of alcohol-related harm to others. This is a growing area of interest in alcohol epidemiology; investigating if it follows in the path of the prevention paradox or not would advance the theory and inform prevention efforts. Also, studying the distribution of alcohol-related harm to others in this context at an early stage could help guide an understanding of alcohol-related harms relevant to a variety of cultures and contexts.

Also, qualitative studies into the expectations and meanings into the use of alcohol would help us better understand the reasons why people drink and why they drink in a particular way (i.e. – risky single-occasion drinking, abstinence), in addition to insight into the social and cognitive mechanisms underlying potentially changing attitudes towards alcohol.

Alcohol epidemiology in Africa could also benefit from studies of alcohol regulations, from their existence, content and enforcement, particularly in states in the early process of developing national alcohol policies. Longitudinal investigations would be helpful in elucidating the relationship between drinking patterns and health consequences, especially among older adults and younger women. Studying drinking patterns in particular in addition to average consumption is important given the potential differential roles of these measures of alcohol use in relation to alcohol-attributable risk. All investigations into alcohol use in Africa should take into account the high rates of lifetime abstinence, if pertinent to the country, when investigating use at the population level by looking at the population of drinkers separately. At the very least, continued monitoring of the prevalence of abstention and the different drinking patterns among women and older adults is required to gauge trends and changes in drinking behavior so that public health efforts can respond accordingly.

REFERENCES

1. ROOM, R., BABOR, T. & REHM, J. (2005) Alcohol and public health, *Lancet*, 365, 519-30.
2. HORNSEY, I. S. (2003) *A History of Beer and Brewing* (Cornwall, UK, The Royal Society of Chemistry).
3. WORLD HEALTH ORGANIZATION, W. (2011) Global status report on alcohol and health (Geneva, Switzerland).
4. REHM, J., MATHERS, C., POPOVA, S. et al. (2009) Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders, *Lancet*, 373, 2223-33.
5. REHM, J., TAYLOR, B., MOHAPATRA, S. et al. (2010) Alcohol as a risk factor for liver cirrhosis: A systematic review and meta-analysis, *Drug and Alcohol Review*, 29, 437-445.
6. PATRA, J., TAYLOR, B., IRVING, H. et al. (2010) Alcohol consumption and the risk of morbidity and mortality for different stroke types - a systematic review and meta-analysis, *Bmc Public Health*, 10.
7. HERNANDEZ-AVILA, C. A., ROUNSAVILLE, B. J. & KRANZLER, H. R. (2004) Opioid-, cannabis- and alcohol-dependent women show more rapid progression to substance abuse treatment, *Drug and Alcohol Dependence*, 74, 265-272.
8. REHM, J., GREENFIELD, T. K. & ROGERS, J. D. (2001) Average volume of alcohol consumption, patterns of drinking, and all-cause mortality: results from the US National Alcohol Survey, *Am J Epidemiol*, 153, 64-71.
9. REHM, J., BALIUNAS, D., BORGES, G. L. et al. (2010) The relation between different dimensions of alcohol consumption and burden of disease: an overview, *Addiction*, 105, 817-43.
10. WORLD HEALTH ORGANIZATION, W. (2004) Global status report on alcohol 2004 (Geneva, Switzerland).
11. WORLD HEALTH ORGANIZATION, W. (2010) *Equity, social determinants and public health programmes* (Geneva, Switzerland).
12. REHM, J., ROOM, R., GRAHAM, K. et al. (2003) The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview, *Addiction*, 98, 1209-28.
13. ROOM, R. & MAKELA, K. (2000) Typologies of the cultural position of drinking, *J Stud Alcohol*, 61, 475-83.
14. REHM, J., REHN, N., ROOM, R. et al. (2003) The global distribution of average volume of alcohol consumption and patterns of drinking, *Eur Addict Res*, 9, 147-56.
15. ROSSOW, I. C., T. (2011) The total consumption model revisited.
16. CHERPITEL, C. J., TAM, T., MIDANIK, L., CAETANO, R. & GREENFIELD, T. (1995) Alcohol and non-fatal injury in the U.S. general population: a risk function analysis, *Accid Anal Prev*, 27, 651-61.
17. CHERPITEL, C. J., BOND, J. & YE, Y. (2006) Alcohol and injury: a risk function analysis from the Emergency Room Collaborative Alcohol Analysis Project (ERCAAP), *Eur Addict Res*, 12, 42-52.
18. LIN, M. R., CHANG, S. H., PAI, L. & KEYL, P. M. (2003) A longitudinal study of risk factors for motorcycle crashes among junior college students in Taiwan, *Accid Anal Prev*, 35, 243-52.

19. FABBRI, A., MARCHESINI, G., MORSELLI-LABATE, A. M. et al. (2001) Blood alcohol concentration and management of road trauma patients in the emergency department, *J Trauma*, 50, 521-8.
20. KASANTIKUL, V., OUELLET, J. V., SMITH, T., SIRATHRANONT, J. & PANICHABHONGSE, V. (2005) The role of alcohol in Thailand motorcycle crashes, *Accid Anal Prev*, 37, 357-66.
21. ADOGU, P. O., ILIKA, A. L. & ASUZU, A. L. (2009) Predictors of road traffic accident, road traffic injury and death among commercial motorcyclists in an urban area of Nigeria, *Niger J Med*, 18, 393-7.
22. MCKEE, M. & BRITTON, A. (1998) The positive relationship between alcohol and heart disease in eastern Europe: potential physiological mechanisms, *J R Soc Med*, 91, 402-7.
23. REHM, J., GMEL, G., SEMPOS, C. T. & TREVISAN, M. (2003) Alcohol-related morbidity and mortality, *Alcohol Res Health*, 27, 39-51.
24. MCELDUFF, P. & DOBSON, A. J. (1997) How much alcohol and how often? Population based case-control study of alcohol consumption and risk of a major coronary event, *BMJ*, 314, 1159-64.
25. TREVISAN, M., SCHISTERMAN, E., MENNOTTI, A., FARCHI, G. & CONTI, S. (2001) Drinking pattern and mortality: the Italian Risk Factor and Life Expectancy pooling project, *Ann Epidemiol*, 11, 312-9.
26. MURRAY, R. P., CONNETT, J. E., TYAS, S. L. et al. (2002) Alcohol volume, drinking pattern, and cardiovascular disease morbidity and mortality: is there a U-shaped function?, *Am J Epidemiol*, 155, 242-8.
27. TAYLOR, B., IRVING, H. M., KANTERES, F. et al. (2010) The more you drink, the harder you fall: a systematic review and meta-analysis of how acute alcohol consumption and injury or collision risk increase together, *Drug Alcohol Depend*, 110, 108-16.
28. DAWSON, D. A. (1996) Temporal drinking patterns and variation in social consequences, *Addiction*, 91, 1623-35.
29. ROOM, R., BONDY, S. J. & FERRIS, J. (1995) The risk of harm to oneself from drinking, Canada 1989, *Addiction*, 90, 499-513.
30. ROSSOW, I. (1996) Alcohol-related violence: the impact of drinking pattern and drinking context, *Addiction*, 91, 1651-61.
31. KALICHMAN, S. C., SIMBAYI, L. C., KAUFMAN, M., CAIN, D. & JOOSTE, S. (2007) Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings, *Prev Sci*, 8, 141-51.
32. SIMBAYI, L. C., KALICHMAN, S. C., JOOSTE, S. et al. (2004) Alcohol use and sexual risks for HIV infection among men and women receiving sexually transmitted infection clinic services in Cape Town, South Africa, *J Stud Alcohol*, 65, 434-42.
33. SCOTT-SHELDON, L. A., CAREY, M. P., CAREY, K. B. et al. (2012) Patterns of alcohol use and sexual behaviors among current drinkers in Cape Town, South Africa, *Addict Behav*, 37, 492-7.
34. MERIKANGAS, K. R., MEHTA, R. L., MOLNAR, B. E. et al. (1998) Comorbidity of substance use disorders with mood and anxiety disorders: results of the International Consortium in Psychiatric Epidemiology, *Addict Behav*, 23, 893-907.
35. PALJARVI, T., KOSKENVUO, M., POIKOLAINEN, K. et al. (2009) Binge drinking and depressive symptoms: a 5-year population-based cohort study, *Addiction*, 104, 1168-78.
36. MURRAY, C. J. & LOPEZ, A. D. (1997) Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study, *Lancet*, 349, 1498-504.

37. RAHAV, G., WILSNACK, R., BLOOMFIELD, K., GMEL, G. & KUNTSCHE, S. (2006) The influence of societal level factors on men's and women's alcohol consumption and alcohol problems, *Alcohol Alcohol Suppl*, 41, i47-55.
38. WILSNACK, R. W., VOGELTANZ, N. D., WILSNACK, S. C. et al. (2000) Gender differences in alcohol consumption and adverse drinking consequences: cross-cultural patterns, *Addiction*, 95, 251-65.
39. ALMEIDA-FILHO, N., LESSA, I., MAGALH ES, L. et al. (2004) Alcohol drinking patterns by gender, ethnicity, and social class in Bahia, Brazil, *Rev Saude Publica*, 38, 45-54.
40. PELTZER, K., MALAKA, D. W. & PHASWANA, N. (2002) Sociodemographic factors, religiosity, academic performance, and substance use among first-year university students in South Africa, *Psychol Rep*, 91, 105-13.
41. MCKEE, M., POMERLEAU, J., ROBERTSON, A. et al. (2000) Alcohol consumption in the Baltic Republics, *J Epidemiol Community Health*, 54, 361-6.
42. MOHAN, D., CHOPRA, A. & SETHI, H. (2002) Incidence estimates of substance use disorders in a cohort from Delhi, India, *Indian J Med Res*, 115, 128-35.
43. SILVEIRA, C. M., SIU, E. R., WANG, Y. P. et al. (2012) Gender differences in drinking patterns and alcohol-related problems in a community sample in Sao Paulo, Brazil, *Clinics (Sao Paulo)*, 67, 205-12.
44. MCPHERSON, M., CASSWELL, S. & PLEDGER, M. (2004) Gender convergence in alcohol consumption and related problems: issues and outcomes from comparisons of New Zealand survey data, *Addiction*, 99, 738-48.
45. KUNTSCHE, E., KUNTSCHE, S., KNIBBE, R. et al. (2011) Cultural and gender convergence in adolescent drunkenness: evidence from 23 European and North American countries, *Arch Pediatr Adolesc Med*, 165, 152-8.
46. MIRAND, A. L. & WELTE, J. W. (1994) Total body water adjustment of mean alcohol intakes, *J Subst Abuse*, 6, 419-25.
47. GOIST, K. C., JR. & SUTKER, P. B. (1985) Acute alcohol intoxication and body composition in women and men, *Pharmacol Biochem Behav*, 22, 811-4.
48. WANG, M. Q., NICHOLSON, M. E., JONES, C. S., FITZHUGH, E. C. & WESTERFIELD, C. R. (1992) Acute alcohol intoxication, body composition, and pharmacokinetics, *Pharmacol Biochem Behav*, 43, 641-3.
49. FREZZA, M., DI PADOVA, C., POZZATO, G. et al. (1990) High blood alcohol levels in women. The role of decreased gastric alcohol dehydrogenase activity and first-pass metabolism, *N Engl J Med*, 322, 95-9.
50. LIEBER, C. S., LEO, M. A., ALEYNIK, S. I., ALEYNIK, M. K. & DECARLI, L. M. (1997) Polyenylphosphatidylcholine decreases alcohol-induced oxidative stress in the baboon, *Alcohol Clin Exp Res*, 21, 375-9.
51. THOMASSON, H. R. (1995) Gender differences in alcohol metabolism. Physiological responses to ethanol, *Recent Dev Alcohol*, 12, 163-79.
52. ERIKSSON, C. J., FUKUNAGA, T., SARKOLA, T., LINDHOLM, H. & AHOLA, L. (1996) Estrogen-related acetaldehyde elevation in women during alcohol intoxication, *Alcohol Clin Exp Res*, 20, 1192-5.
53. JEAVONS, C. M. & ZEINER, A. R. (1984) Effects of elevated female sex steroids on ethanol and acetaldehyde metabolism in humans, *Alcohol Clin Exp Res*, 8, 352-8.
54. HAHN, R. G., NORBERG, A., GABRIELSSON, J., DANIELSSON, A. & JONES, A. W. (1994) Eating a meal increases the clearance of ethanol given by intravenous infusion, *Alcohol Alcohol*, 29, 673-7.

55. LAMMERS, S. M., MAINZER, D. E. & BRETELER, M. H. (1995) Do alcohol pharmacokinetics in women vary due to the menstrual cycle?, *Addiction*, 90, 23-30.
56. MCDONALD, M. (1994) Drinking and social identity in the west of France, in: Mcdonald, M. (Ed.) *Gender, Drink and Drugs*, pp. 99-124 (Providence, RI, Berg).
57. GOTOH, M. (1994) Alcohol Dependence of Women in Japan, *Addiction*, 89, 953-954.
58. GRAHAM, K., WILSNACK, R., DAWSON, D. & VOGELTANZ, N. (1998) Should alcohol consumption measures be adjusted for gender differences?, *Addiction*, 93, 1137-1147.
59. GREENFIELD, T. K., MIDANIK, L. T. & ROGERS, J. D. (2000) A 10-year national trend study of alcohol consumption, 1984-1995: is the period of declining drinking over?, *Am J Public Health*, 90, 47-52.
60. MAKELA, P., GMEL, G., GRITTNER, U. et al. (2006) Drinking patterns and their gender differences in Europe, *Alcohol Alcohol Suppl*, 41, i8-18.
61. BLOOMFIELD, K., GRITTNER, U., RASMUSSEN, H. B. & PETERSEN, H. C. (2008) Socio-demographic correlates of alcohol consumption in the Danish general population, *Scand J Public Health*, 36, 580-8.
62. PELTZER, K., DAVIDS, A. & NJUHO, P. (2011) Alcohol use and problem drinking in South Africa: findings from a national population-based survey, *Afr J Psychiatry (Johannesbg)*, 14, 30-7.
63. NAIMI, T. S., BREWER, R. D., MOKDAD, A. et al. (2003) Binge drinking among US adults, *JAMA*, 289, 70-5.
64. BLAZER, D. G. & WU, L. T. (2009) The epidemiology of at-risk and binge drinking among middle-aged and elderly community adults: National Survey on Drug Use and Health, *Am J Psychiatry*, 166, 1162-9.
65. BJORK, C., THYGESEN, L. C., VINTHER-LARSEN, M. & GRONBAEK, M. N. (2008) Time trends in heavy drinking among middle-aged and older adults in Denmark, *Alcohol Clin Exp Res*, 32, 120-7.
66. CASTRO-COSTA, E., FERRI, C. P., LIMA-COSTA, M. F. et al. (2008) Alcohol consumption in late-life--the first Brazilian National Alcohol Survey (BNAS), *Addict Behav*, 33, 1598-601.
67. MARMOT, M. (1997) Inequality, deprivation and alcohol use, *Addiction*, 92 Suppl 1, S13-20.
68. VAN OERS, J. A., BONGERS, I. M., VAN DE GOOR, L. A. & GARRETSEN, H. F. (1999) Alcohol consumption, alcohol-related problems, problem drinking, and socioeconomic status, *Alcohol Alcohol*, 34, 78-88.
69. BLOOMFIELD, K. (2000) Alcohol Consumption and Alcohol Problems Among Women in European Countries, *Subst Abus*, 21, 223-229.
70. GRITTNER, U., KUNTSCHE, S., GMEL, G. & BLOOMFIELD, K. (2012) Alcohol consumption and social inequality at the individual and country levels--results from an international study, *Eur J Public Health*.
71. ANTHONY, J. C. & ECHEAGARAY-WAGNER, F. (2000) Epidemiologic analysis of alcohol and tobacco use, *Alcohol Res Health*, 24, 201-8.
72. FALK, D. E., YI, H. Y. & HILLER-STURMHOFEL, S. (2006) An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: findings from the National Epidemiologic Survey on Alcohol and Related Conditions, *Alcohol Res Health*, 29, 162-71.

73. BOBO, J. K., MCILVAIN, H. E., LANDO, H. A., WALKER, R. D. & LEED-KELLY, A. (1998) Effect of smoking cessation counseling on recovery from alcoholism: findings from a randomized community intervention trial, *Addiction*, 93, 877-87.
74. ROMBERGER, D. J. & GRANT, K. (2004) Alcohol consumption and smoking status: the role of smoking cessation, *Biomed Pharmacother*, 58, 77-83.
75. ROOM, R. (2004) Smoking and drinking as complementary behaviours, *Biomed Pharmacother*, 58, 111-5.
76. LE, A. D., QUAN, B., JUZYTCH, W. et al. (1998) Reinstatement of alcohol-seeking by priming injections of alcohol and exposure to stress in rats, *Psychopharmacology*, 135, 169-174.
77. CHEN, W. J. A., PARNELL, S. E. & WEST, J. R. (2001) Nicotine decreases blood alcohol concentration in neonatal rats, *Alcoholism-Clinical and Experimental Research*, 25, 1072-1077.
78. LITTLE, H. J. (2000) Behavioral mechanisms underlying the link between smoking and drinking, *Alcohol Research & Health*, 24, 215-224.
79. SHIFFMAN, S., HICKCOX, M., PATY, J. A. et al. (1997) Individual differences in the context of smoking lapse episodes, *Addictive Behaviors*, 22, 797-811.
80. ROOM, R. (2004) Smoking and drinking as complementary behaviours, *Biomedicine & Pharmacotherapy*, 58, 111-115.
81. SAATCIOGLU, O., YAPICI, A. & CAKMAK, D. (2008) Quality of life, depression and anxiety in alcohol dependence, *Drug Alcohol Rev*, 27, 83-90.
82. VAN DIJK, A. P., TOET, J. & VERDURMEN, J. E. (2004) The relationship between health-related quality of life and two measures of alcohol consumption, *J Stud Alcohol*, 65, 241-9.
83. STRANGES, S., NOTARO, J., FREUDENHEIM, J. L. et al. (2006) Alcohol drinking pattern and subjective health in a population-based study, *Addiction*, 101, 1265-76.
84. VOLK, R. J., CANTOR, S. B., STEINBAUER, J. R. & CASS, A. R. (1997) Alcohol use disorders, consumption patterns, and health-related quality of life of primary care patients, *Alcohol Clin Exp Res*, 21, 899-905.
85. JOHNSON, T. J., SHEETS, V. L. & KRISTELLER, J. L. (2008) Identifying mediators of the relationship between religiousness/spirituality and alcohol use, *J Stud Alcohol Drugs*, 69, 160-70.
86. CRUZ, J. E., EMERY, R. E. & TURKHEIMER, E. (2012) Peer Network Drinking Predicts Increased Alcohol Use From Adolescence to Early Adulthood After Controlling for Genetic and Shared Environmental Selection, *Dev Psychol*.
87. BLOOMFIELD, K., STOCKWELL, T., GMEL, G. & REHN, N. (2003) International comparisons of alcohol consumption, *Alcohol Res Health*, 27, 95-109.
88. WAGENAAR, A. C., TOBLER, A. L. & KOMRO, K. A. (2010) Effects of alcohol tax and price policies on morbidity and mortality: a systematic review, *Am J Public Health*, 100, 2270-8.
89. SKOG, O. J. (1985) The collectivity of drinking cultures: a theory of the distribution of alcohol consumption, *Br J Addict*, 80, 83-99.
90. GMEL, G. & REHM, J. The empirical testability of Skog's theory of collective drinking behaviour.
91. SORNPAISARN, B., SHIELD, K. D. & REHM, J. (2012) Alcohol taxation policy in Thailand: implications for other low- to middle-income countries, *Addiction*.

92. JAMISON, D. T. & MOSLEY, W. H. (1991) Disease control priorities in developing countries: health policy responses to epidemiological change, *Am J Public Health*, 81, 15-22.
93. ROTHMAN, K. (2008) *Modern Epidemiology* (USA, Lippincott Williams & Wilkins).
94. KRIEGER, N. (2011) *Epidemiology and the People's Health* (New York, NY, Oxford University Press).
95. SZKLO, M. N. J. (2007) *Epidemiology Beyond the Basics* (Sudbury, MA, USA, Jones and Bartlett Publishers).
96. WHO (2013) Commission on Social Determinants of Health - final report (Geneva, Switzerland, World Health Organization).
97. KRIEGER, N. (2003) Latin American social medicine: the quest for social justice and public health, *Am J Public Health*, 93, 1989-91.
98. RAPHAEL, D. (2003) Barriers to addressing the societal determinants of health: public health units and poverty in Ontario, Canada, *Health Promot Int*, 18, 397-405.
99. CWIKEL, J. G. (2006) *Social Epidemiology Strategies for Public Health Activism* (New York , NY, Columbia University Press).
100. DAHLGREN, G. W., M. (1991) *Policies and strategies to promote social equity in health* (Stockholm, Institute for Future Studies).
101. ROSE, G. (1981) Strategy of prevention: lessons from cardiovascular disease, *Br Med J (Clin Res Ed)*, 282, 1847-51.
102. ROSE, G. (1985) Sick individuals and sick populations, *Int J Epidemiol*, 14, 32-8.
103. ROSE, G. (1992) *Rose's Strategy of Preventive Medicine* (New York, NY, Oxford University Press).
104. KREITMAN, N. (1986) Alcohol-Consumption and the Preventive Paradox, *British Journal of Addiction*, 81, 353-363.
105. STOCKWELL, T., HAWKS, D., LANG, E. & RYDON, P. (1996) Unravelling the preventive paradox for acute alcohol problems, *Drug and Alcohol Review*, 15, 7-15.
106. SKOG, O. J. (2006) Alcohol and the so-called prevention paradox: how does it look today?, *Addiction*, 101, 155-8.
107. WILSNACK, R. W., S.; OBOT, I. (2005) Why Study Gender, Alcohol and Culture?, in: Obot, I. R., R. (Ed.) *Alcohol, Gender and Drinking Problems Perspectives from Low and Middle Income Countries*

(Geneva, Switzerland, World Health Organization).
108. MARTIN, A. L. (2001) *Alcohol, Sex, and Gender in Late Medieval and Early Modern Europe* (New York, NY, Palgrave).
109. WILLIS, J. (2002) *Potent Brews: A Social History of Alcohol in East Africa 1850-1999* (Great Britian, The British Institute in Eastern Africa).
110. AKYEAMPONG, E. (1995) Alcoholism in Ghana--a socio-cultural exploration, *Cult Med Psychiatry*, 19, 261-80.
111. ROBERTS, B. (2004) Drinking like a man: The paradox of excessive drinking for seventeenth-century Dutch youths, *Journal of Family History*, 29, 237-252.
112. HARFORD, T. C., WECHSLER, H. & MUTHEN, B. O. (2003) Alcohol-related aggression and drinking at off-campus parties and bars: A national study of current drinkers in college, *Journal of Studies on Alcohol*, 64, 704-711.
113. PARROTT, D. J. & GIANCOLA, P. R. (2004) A further examination of the relation between trait anger and alcohol-related aggression: The role of anger control, *Alcoholism-Clinical and Experimental Research*, 28, 855-864.

114. GIANCOLA, P. R. (2002) Irritability, acute alcohol consumption and aggressive behavior in men and women, *Drug and Alcohol Dependence*, 68, 263-274.
115. DEMMEL, R. & HAGEN, J. (2004) The structure of positive alcohol expectancies in alcohol-dependent inpatients, *Addiction Research & Theory*, 12, 125-140.
116. MORR, M. C. & MONGEAU, P. A. (2004) First-date expectations - The impact of sex of initiator, alcohol consumption, and relationship type, *Communication Research*, 31, 3-35.
117. CAMPBELL, A., MUNCER, S. & BIBEL, D. (2001) Women and crime - An evolutionary approach, *Aggression and Violent Behavior*, 6, 481-497.
118. ENGWALL, D., HUNTER, R. & STEINBERG, M. (2004) Gambling and other risk behaviors on university campuses, *Journal of American College Health*, 52, 245-255.
119. ZUCKERMAN, M. & KUHLMAN, D. M. (2000) Personality and risk-taking: common biosocial factors, *J Pers*, 68, 999-1029.
120. HILL, E. M. & CHOW, K. (2002) Life-history theory and risky drinking, *Addiction*, 97, 401-413.
121. ARMELI, S., CARNEY, M. A., TENNEN, H., AFFLECK, G. & O'NEIL, T. P. (2000) Stress and alcohol use: A daily process examination of the stressor-vulnerability model, *Journal of Personality and Social Psychology*, 78, 979-994.
122. AHLSTROM, S., BLOOMFIELD, K. & KNIBBE, R. (2001) Gender Differences in Drinking Patterns in Nine European Countries: Descriptive Findings, *Subst Abus*, 22, 69-85.
123. WILSNACK, R. W. & CHELOHA, R. (1987) Womens Roles and Problem Drinking across the Life-Span, *Social Problems*, 34, 231-248.
124. GMEL, G., BLOOMFIELD, K., AHLSTROM, S., CHOQUET, M. & LECOMTE, T. (2000) Women's Roles and Women's Drinking: A Comparative Study in Four European Countries, *Subst Abus*, 21, 249-264.
125. RUNDBERG, J., LIDFELDT, J., NERBRAND, C. et al. (2008) Abstinence, occasional drinking and binge drinking in middle-aged women. The women's health in Lund area (WHILA) study, *Nordic Journal of Psychiatry*, 62, 186-191.
126. ADOMAKOH, C. C. (1976) Alcoholism: the African Scene, *Ann N Y Acad Sci*, 273, 39-46.
127. PRETORIUS, L., NAIDOO, A. & REDDY, S. P. (2009) "Kitchen cupboard drinking": a review of South African women's secretive alcohol addiction, treatment history, and barriers to accessing treatment, *Soc Work Public Health*, 24, 89-99.
128. REHM, J., GREENFIELD, T. K., WALSH, G. et al. (1999) Assessment methods for alcohol consumption, prevalence of high risk drinking and harm: a sensitivity analysis, *Int J Epidemiol*, 28, 219-24.
129. CIPRIANI, F., LANDUCCI, S. & BLOOMFIELD, K. (2001) Alcohol-Related Mortality in Europe: A Tentative Analysis from the EU Project "Alcohol Consumption and Alcohol Problems among Women in European Countries", *Subst Abus*, 22, 55-67.
130. MUKAMAL, K. J., CHUNG, H., JENNY, N. S. et al. (2005) Alcohol use and risk of ischemic stroke among older adults: the cardiovascular health study, *Stroke*, 36, 1830-4.
131. NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM, N. (2003) Helping patients with alcohol problems: A health practicioner's guide. , in: Health, N. I. o. (Ed.) (NIH).
132. OBOT, I. S. (1990) Substance abuse, health and social welfare in Africa: an analysis of the Nigerian experience, *Soc Sci Med*, 31, 699-704.
133. ACUDA, S. W. (1985) Alcohol and alcohol problems research 1. East Africa, *Br J Addict*, 80, 121-6.

134. IKUESAN, B. A. (1994) Drinking problems and the position of women in Nigeria, *Addiction*, 89, 941-4; discussion 951-60.
135. CLAUSEN, T., ROSSOW, I., NAIDOO, N. & KOWAL, P. (2009) Diverse alcohol drinking patterns in 20 African countries, *Addiction*, 104, 1147-54.
136. OBOT, I., JOS, N. (2006) Alcohol use and related problems in sub-Saharan Africa, *African Journal of Drug and Alcohol Studies*, 5, 17-28.
137. ODEJIDE, A. (2006) Status of Drug Use/Abuse in Africa: A Review, *International Journal of Mental Health and Addiction*, 4, 87-102.
138. REHM, J., KANTERES, F. & LACHENMEIER, D. W. (2010) Unrecorded consumption, quality of alcohol and health consequences, *Drug Alcohol Rev*, 29, 426-36.
139. HAHN, J. A. & SAMET, J. H. (2010) Alcohol and HIV disease progression: weighing the evidence, *Curr HIV/AIDS Rep*, 7, 226-33.
140. ODEJIDE, O. A., OHAERI, J. U., ADELEKAN, M. L. & IKUESAN, B. A. (1987) Drinking behaviour and social change among youths in Nigeria--a study of two cities, *Drug Alcohol Depend*, 20, 227-33.
141. CHANDIWANA, S. K., SEBIT, M. B., LATIF, A. S. et al. (1999) Alcohol consumption in HIV-I infected persons: a study of immunological markers, Harare, Zimbabwe, *Cent Afr J Med*, 45, 303-8.
142. MBULAITEYE, S. M., RUBERANTWARI, A., NAKIYINGI, J. S. et al. (2000) Alcohol and HIV: a study among sexually active adults in rural southwest Uganda, *Int J Epidemiol*, 29, 911-5.
143. HELMAN, C. G. (2007) *Culture, Health and Illness* (London, UK, Hodder Arnold).
144. AKYEAMPONG, E. (1996) *Drink, Power, and Cultural Change: A Social History of Alcohol in Ghana, c. 1800 to Recent Times* (Portsmouth, NH, USA, Heinemann).
145. KARP, I. (1980) Beer Drinking and Social Experience in an African Society: An Essay in Formal Sociology, in: Karp, I. B., C. (Ed.) *Explorations in African Systems of Thought*, pp. 83-115 (Bloomington).
146. KILSON, M. (1969) Libation in Ga ritual, *Journal of Religion in Africa*, 2, 161-178.
147. ROOM, R. J. D. C.-M., B., GUREJE, O., MAKELA, K.; MARSHALL, M.; MEDINA-MORA M.; MONTEIRO, M.; PARRY, C.; PARTANEN, J.; RILEY, L.; SAXENA, S. (2002) *Alcohol in Developing Societies: A Public Health Approach* (Helsinki, Finland, Hakapaino Oy).
148. VAN ONSELEN, C. (1982) *Studies in the social and economic history of the Witwatersrand, 1886-1914* (New York, NY, Longman).
149. BRUUN, K. (1975) *The gentlemen's club: international control of drugs and alcohol* (Chicago & London, University of Chicago Press).
150. ROOM, R. (1990) Drink, popular protest and government regulation in colonial empires: a comment on papers by Kicza, Penvenne and Ambler, *Drining and drug practices surveyor*, 23, 3-6.
151. AO, T. T., SAM, N., KIWELU, I. et al. (2011) Risk factors of alcohol problem drinking among female bar/hotel workers in Moshi, Tanzania: a multi-level analysis, *AIDS Behav*, 15, 330-9.
152. BALIUNAS, D., REHM, J., IRVING, H. & SHUPER, P. (2010) Alcohol consumption and risk of incident human immunodeficiency virus infection: a meta-analysis, *Int J Public Health*, 55, 159-66.
153. WORLD HEALTH ORGANIZATION, W. (2006) Framework for alcohol policy in the WHO European Region (Geneva, Switzerland, World Health Organziation).

154. ACUDA, W., OTHIENO, C. J., OBONDO, A. & CROME, I. B. (2011) The epidemiology of addiction in Sub-Saharan Africa: a synthesis of reports, reviews, and original articles, *Am J Addict*, 20, 87-99.
155. WEISER, S. D., LEITER, K., HEISLER, M. et al. (2006) A population-based study on alcohol and high-risk sexual behaviors in Botswana, *PLoS Med*, 3, e392.
156. IBANGA, A. A. A., DAGONA Z, ZARICK H, OJIJI O (2005) The contexts of alcohol consumption by men and women in Nigeria, in: Obot, I., Room, R. (Ed.) *Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries*, pp. 143-166 (Geneva, World Health Organization).
157. TUMWESIGYE, N. M., KASIRYE, R. (2005) Gender and the major consequences of alcohol consumption in Uganda, in: Obot, I., Room, R. (Ed.) *Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries* (Geneva, World Health Organization).
158. ZABLOTSKA, I. B., GRAY, R. H., KOENIG, M. A. et al. (2009) Alcohol use, intimate partner violence, sexual coercion and HIV among women aged 15-24 in Rakai, Uganda, *AIDS Behav*, 13, 225-33.
159. CHERSICH, M. F. & REES, H. V. (2008) Vulnerability of women in southern Africa to infection with HIV: biological determinants and priority health sector interventions, *AIDS*, 22 Suppl 4, S27-40.
160. MAY, P. A., GOSSAGE, J. P., BROOKE, L. E. et al. (2005) Maternal risk factors for fetal alcohol syndrome in the Western cape province of South Africa: a population-based study, *Am J Public Health*, 95, 1190-9.
161. MBATIA, J., JENKINS, R., SINGLETON, N. & WHITE, B. (2009) Prevalence of alcohol consumption and hazardous drinking, tobacco and drug use in urban Tanzania, and their associated risk factors, *Int J Environ Res Public Health*, 6, 1991-2006.
162. ALMEIDA-FILHO, N., LESSA, I., MAGALHAES, L. et al. (2005) Social inequality and alcohol consumption-abuse in Bahia, Brazil-- interactions of gender, ethnicity and social class, *Soc Psychiatry Psychiatr Epidemiol*, 40, 214-22.
163. BLOOMFIELD, K., GRITTNER, U., KRAMER, S. & GMEL, G. (2006) Social inequalities in alcohol consumption and alcohol-related problems in the study countries of the EU concerted action 'Gender, Culture and Alcohol Problems: a Multi-national Study', *Alcohol Alcohol Suppl*, 41, i26-36.
164. DE BRUUN, A. (2011) Alcohol Marketing Practices in Africa: Findings from The Gambia, Ghana, Nigeria and Uganda (Dutch Institute for Alcohol Policy (STAP)).
165. LIMA, V. D., HOGG, R. S., HARRIGAN, P. R. et al. (2007) Continued improvement in survival among HIV-infected individuals with newer forms of highly active antiretroviral therapy, *AIDS*, 21, 685-92.
166. MOORE, A. A., GIULI, L., GOULD, R. et al. (2006) Alcohol use, comorbidity, and mortality, *J Am Geriatr Soc*, 54, 757-62.
167. PARRY, C. D., PATRA, J. & REHM, J. (2011) Alcohol consumption and non-communicable diseases: epidemiology and policy implications, *Addiction*, 106, 1718-24.
168. KLATSKY, A. L. (2007) Alcohol, cardiovascular diseases and diabetes mellitus, *Pharmacol Res*, 55, 237-47.
169. RUSSELL, M., COOPER, M. L., FRONE, M. R. & WELTE, J. W. (1991) Alcohol drinking patterns and blood pressure, *Am J Public Health*, 81, 452-7.

170. SUN, Q., TOWNSEND, M. K., OKEREKE, O. I. et al. (2011) Alcohol consumption at midlife and successful ageing in women: a prospective cohort analysis in the nurses' health study, *PLoS Med*, 8, e1001090.
171. BRESLOW, R. A. & SMOTHERS, B. (2004) Drinking patterns of older Americans: National Health Interview Surveys, 1997-2001, *J Stud Alcohol*, 65, 232-40.
172. KARLAMANGLA, A., ZHOU, K., REUBEN, D., GREENDALE, G. & MOORE, A. (2006) Longitudinal trajectories of heavy drinking in adults in the United States of America, *Addiction*, 101, 91-9.
173. LEVENSON, M. R., ALDWIN, C. M. & SPIRO, A., 3RD (1998) Age, cohort and period effects on alcohol consumption and problem drinking: findings from the Normative Aging Study, *J Stud Alcohol*, 59, 712-22.
174. HAJEMA, K. J., KNIBBE, R. A. & DROP, M. J. (1997) Changes in alcohol consumption in a general population in The Netherlands: a 9-year follow-up study, *Addiction*, 92, 49-60.
175. WILSNACK, S. C., WILSNACK, R. W., KRISTJANSON, A. F., VOGELTANZ-HOLM, N. D. & WINDLE, M. (2004) Alcohol use and suicidal behavior in women: longitudinal patterns in a U.S. national sample, *Alcohol Clin Exp Res*, 28, 38S-47S.
176. BJORK, C., VINTHER-LARSEN, M., THYGESEN, L. C., JOHANSEN, D. & GRONBAEK, M. N. (2006) [Alcohol consumption by middle-aged and elderly Danes from 1987 to 2003], *Ugeskr Laeger*, 168, 3317-21.
177. BAKKE, O. & ENDAL, D. (2010) Vested interests in addiction research and policy alcohol policies out of context: drinks industry supplanting government role in alcohol policies in sub-Saharan Africa, *Addiction*, 105, 22-8.
178. MATZOPOULOS, R., PARRY, C. D., CORRIGALL, J. et al. (2012) Global Fund collusion with liquor giant is a clear conflict of interest, *Bull World Health Organ*, 90, 67-9; discussion 70.
179. JERNIGAN, D. H., MONTEIRO, M., ROOM, R. & SAXENA, S. (2000) Towards a global alcohol policy: alcohol, public health and the role of WHO, *Bull World Health Organ*, 78, 491-9.
180. CIA (2013) The World Factbook (Central Intelligence Agency).
181. WHO (2011) WHO Country Profiles 2011 (World Health Organization).
182. ADEDZE, A. (2002) Ghana, in: Eyoh, D. Z. P. T. (Ed.) *Encyclopedia of Twentieth-Century African History*, pp. 237-238 (Routledge).
183. LA VERLE, B. (1994) *Ghana: A Country Study* (Washington, Library of Congress).
184. UNAIDS (2012) Country progress reports (UNAIDS).
185. WORLD BANK, W. (2011) Country Classification.
186. HENDRICKS, C. (2002) South Africa, in: Eyoh, D. Z. P. T. (Ed.) *Encyclopedia of Twentieth-Century African History*, pp. 508-510 (Routledge).
187. AFRICA, S. (2012) South Africa: fast facts (Big Media Publishers).
188. UNAIDS (2012) Global AIDS Response progress reporting 2012 (Geneva, Switzerland, UNAIDS).
189. WORLD HEALTH ORGANIZATION, W. (2012) World Health Survey.
190. WORLD HEALTH ORGANIZATION, W. (2012) Study on global AGEing and adult health
191. SAXENA, S., CARLSON, D. & BILLINGTON, R. (2001) The WHO quality of life assessment instrument (WHOQOL-Bref): the importance of its items for cross-cultural research, *Qual Life Res*, 10, 711-21.

192. WORLD HEALTH ORGANIZATION, W. (1997) WHOQOL Measuring Quality of Life (World Health Organization).
193. CENTRE FOR PARTICIPANT REPORTED OUTCOMES, A. (2007) WHOQoL-8, in: Melbourne, T. U. o. (Ed.).
194. R DEVELOPMENT CORE TEAM, R. (2008) R: A language and environment for statistical computing (Vienna, Austria, R Foundation for Statistical Computing).
195. STATACORP (2011) Stata Statistical Software: Release 12 (College Station, TX, StataCorp LP).
196. RUBIN, D. B. (1987) *Multiple Imputation for Nonresponse in Surveys* (USA, John Wiley & Sons, Inc.).
197. STATACORP (2009) Stata 11 Base Reference Manual (College Station, TX, Stata Press).
198. WOOD, S. N. (2006) Generalized Additive Models: An Introduction with R (Boca Raton, FL, Chapman & Hall/CRC).
199. HARTIGAN, J. A., WONG M.A. (1979) Algorithm AS 136: A K-Means Clustering Algorithm, *Journal of the Royal Statistical Society Series C (Applied Statistics)*, 28, 100-8.
200. MAUSNER, J. S., BAHN, A.K. (1985) *Epidemiology: An introductory text* (W.B. Saunders Company).
201. CAMPBELL, D. T., STANLEY, J.C. (1966) *Experimental and quasi-experimental designs for research* (Chicago, Rand McNally).
202. ISAAC, S. M., W.B. (1971) *Handbook in research and evaluation* (San Diego, EdITS).
203. LOHR, S. L. (2010) *Sampling: Design and Analysis* (USA, Brooks/Cole, Cengage Learning).
204. TSUANG, M. T., COHEN M. (2002) *Textbook in Psychiatric Epidemiology* (New York, Wiley-Liss).
205. PORTA, M. (2008) *A dictionary of epidemiology* (New York, USA, Oxford University Press).
206. PUNCH, K. F. (2003) *Survey Research: The Basics* (London, Sage Publications Ltd.).
207. GALEA, S. & TRACY, M. (2007) Participation rates in epidemiologic studies, *Ann Epidemiol*, 17, 643-53.
208. GELMAN, A., CARLIN, J.B. (2000) *Poststratification and Weighting Adjustments* (Wiley).
209. BIEMER, P. P., LYBERG L.E. (2003) *Introduction to Survey Quality* (Hoboken, New Jersey, John Wiley & Sons, Inc.).
210. BABOR, T. F., STEINBERG, K., ANTON, R. & DEL BOCA, F. (2000) Talk is cheap: measuring drinking outcomes in clinical trials, *J Stud Alcohol*, 61, 55-63.
211. DEL BOCA, F. K. & NOLL, J. A. (2000) Truth or consequences: the validity of self-report data in health services research on addictions, *Addiction*, 95 Suppl 3, S347-60.
212. DEL BOCA, F. K. & DARKES, J. (2003) The validity of self-reports of alcohol consumption: state of the science and challenges for research, *Addiction*, 98 Suppl 2, 1-12.
213. DEVOS-COMBY, L. & LANGE, J. E. (2008) "My drink is larger than yours"? A literature review of self-defined drink sizes and standard drinks, *Curr Drug Abuse Rev*, 1, 162-76.
214. TAYLOR, K. (2008) Katine: hidden habits go untackled *The Guardian* (London, Guardian Media Group).
215. HAM, L. S. & HOPE, D. A. (2003) College students and problematic drinking: a review of the literature, *Clinical psychology review*, 23, 719-59.
216. GREENFIELD, T. K., HARFORD, T. C. & TAM, T. W. (2009) Modeling cognitive influences on drinking and alcohol problems, *J Stud Alcohol Drugs*, 70, 78-86.

217. BELSON, W. (1981) *The Design and Understanding of Survey Questions* (London, Gower).
218. GREENFIELD, T. K. & KERR, W. C. (2008) Alcohol measurement methodology in epidemiology: recent advances and opportunities, *Addiction*, 103, 1082-99.
219. GREENFIELD, T. K. (2000) Ways of measuring drinking patterns and the difference they make: experience with graduated frequencies, *J Subst Abuse*, 12, 33-49.
220. REHM, J., IRVING, H., YE, Y. et al. (2008) Are lifetime abstainers the best control group in alcohol epidemiology? On the stability and validity of reported lifetime abstention, *Am J Epidemiol*, 168, 866-71.
221. MICHALAK, L. & TROCKI, K. (2009) Comments on surveying alcohol in Africa, *Addiction*, 104, 1155-6.
222. GUMEDE, M. V. (1995) *Alcohol misuse and abuse in South Africa* (Pietermaritzburg, South Africa, Reach Out Publishers).
223. LANGENBUCHER, J. & MERRILL, J. (2001) The validity of self-reported cost events by substance abusers. Limits, liabilities, and future directions, *Eval Rev*, 25, 184-210.
224. MOSHA, D., WANGABO, J., MHINZI, G. (1996) African traditional brews: how safe are they? , *Food Chemistry*, 57, 205-209.
225. FRITZ, K., MCFARLAND, W., WYROD, R. et al. (2011) Evaluation of a peer network-based sexual risk reduction intervention for men in beer halls in Zimbabwe: results from a randomized controlled trial, *AIDS Behav*, 15, 1732-44.
226. DAWSON, D. A., GRANT, B. F., STINSON, F. S. & CHOU, P. S. (2005) Psychopathology associated with drinking and alcohol use disorders in the college and general adult populations, *Drug Alcohol Depend*, 77, 139-50.
227. SWAGELL, C. D., LAWFORD, B. R., HUGHES, I. P. et al. (2012) DRD2 C957T and TaqIA Genotyping Reveals Gender Effects and Unique Low-Risk and High-Risk Genotypes in Alcohol Dependence, *Alcohol and alcoholism*.
228. BARTLEY, P. C. & REZVANI, A. H. (2012) Alcohol and cognition - consideration of age of initiation, usage patterns and gender: a brief review, *Curr Drug Abuse Rev*, 5, 87-97.
229. STOCKWELL, T., MCLEOD, R., STEVENS, M. et al. (2002) Alcohol consumption, setting, gender and activity as predictors of injury: a population-based case-control study, *J Stud Alcohol*, 63, 372-9.
230. ICAP (2013) International Drinking Guidelines (International Center for Alcohol Policies).
231. ROOM, R. & REHM, J. (2012) Clear criteria based on absolute risk: reforming the basis of guidelines on low-risk drinking, *Drug Alcohol Rev*, 31, 135-40.
232. STOCKWELL, T., BUTT, P., BEIRNESS, D., GLIKSMAN, L. & PARADIS, C. (2012) The basis for Canada's new low-risk drinking guidelines: a relative risk approach to estimating hazardous levels and patterns of alcohol use, *Drug Alcohol Rev*, 31, 126-34.
233. KRAUS, L., BLOOMFIELD, K., AUGUSTIN, R. & REESE, A. (2000) Prevalence of alcohol use and the association between onset of use and alcohol-related problems in a general population sample in Germany, *Addiction*, 95, 1389-401.
234. ROERECKE, M., GREENFIELD, T. K., KERR, W. C. et al. (2011) Heavy drinking occasions in relation to ischaemic heart disease mortality-- an 11-22 year follow-up of the 1984 and 1995 US National Alcohol Surveys, *Int J Epidemiol*, 40, 1401-10.
235. CASTROAND, D. S., SANCHEZ, Z. M., ZALESKI, M. et al. (2012) Sociodemographic characteristics associated with binge drinking among Brazilians, *Drug Alcohol Depend*.

236. SEITZ, H. K., PELUCCHI, C., BAGNARDI, V. & LA VECCHIA, C. (2012) Epidemiology and pathophysiology of alcohol and breast cancer: Update 2012, *Alcohol Alcohol*, 47, 204-12.
237. OBOT, I. S. (2000) The measurement of drinking patterns and alcohol problems in Nigeria, *J Subst Abuse*, 12, 169-81.
238. BENNETT, L. A., CAMPILLO, C., CHANDRASHEKAR, C. R. & GUREJE, O. (1998) Alcoholic beverage consumption in India, Mexico, and Nigeria: a cross-cultural comparison, *Alcohol Health Res World*, 22, 243-52.
239. WORLD HEALTH ORGANIZATION, W. (2012) Definition of an older or elderly person.
240. BOWDEN, A. & FOX-RUSHBY, J. A. (2003) A systematic and critical review of the process of translation and adaptation of generic health-related quality of life measures in Africa, Asia, Eastern Europe, the Middle East, South America, *Soc Sci Med*, 57, 1289-306.
241. LAING, A. (2012) South Africa considers law banning sale of alcohol to pregnant women *The Telegraph*.
242. MCCARTHY, J. (2012) South Africa: Alcohol Advertising Ban - Politically Correct, Shortsighted, Wrong.
243. BLOOMFIELD, K., GMEL, G. & WILSNACK, S. (2006) Introduction to special issue 'Gender, Culture and Alcohol Problems: a Multi-national Study', *Alcohol Alcohol Suppl*, 41, i3-7.
244. HOLMES, M. D., DALAL, S., VOLMINK, J. et al. (2010) Non-communicable diseases in sub-Saharan Africa: the case for cohort studies, *PLoS Med*, 7, e1000244.
245. CAETANO, R. & LARANJEIRA, R. (2006) A 'perfect storm' in developing countries: economic growth and the alcohol industry, *Addiction*, 101, 149-52.
246. CASSWELL, S. (2009) Alcohol industry and alcohol policy--the challenge ahead, *Addiction*, 104 Suppl 1, 3-5.
247. STEARNS, P. N. (2001) *Consumerism in World History* (New York and London, Routledge Taylor & Francisc).
248. SKOG, O. J. & ROSSOW, I. (2006) Flux and stability: individual fluctuations, regression towards the mean and collective changes in alcohol consumption, *Addiction*, 101, 959-70.
249. WORLD HEALTH ORGANIZATION, W. (2008) Actions to reduce the harmful use of alcohol: Report of the Regional Director (Geneva, Regional Committee for Africa, World Health Organization).
250. ROSENTHAL, J., CHRISTIANSON, A. & CORDERO, J. (2005) Fetal alcohol syndrome prevention in South Africa and other low-resource countries, *Am J Public Health*, 95, 1099-101.
251. WECHSBERG, W. M., WU, L. T., ZULE, W. A. et al. (2009) Substance abuse, treatment needs and access among female sex workers and non-sex workers in Pretoria, South Africa, *Subst Abuse Treat Prev Policy*, 4, 11.
252. VILJOEN, D. L., GOSSAGE, J. P., BROOKE, L. et al. (2005) Fetal alcohol syndrome epidemiology in a South African community: a second study of a very high prevalence area, *J Stud Alcohol*, 66, 593-604.
253. NORMAN, R., SCHNEIDER, M., BRADSHAW, D. et al. (2010) Interpersonal violence: an important risk factor for disease and injury in South Africa, *Popul Health Metr*, 8, 32.
254. MURRAY, C. J. & LOPEZ, A. D. (1997) Regional patterns of disability-free life expectancy and disability-adjusted life expectancy: global Burden of Disease Study, *Lancet*, 349, 1347-52.

255. MURRAY, C. J. & LOPEZ, A. D. (1997) Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study, *Lancet*, 349, 1436-42.
256. DALAL, S., BEUNZA, J. J., VOLMINK, J. et al. (2011) Non-communicable diseases in sub-Saharan Africa: what we know now, *Int J Epidemiol*, 40, 885-901.
257. PARRY, C., REHM, J., POZNYAK, V. & ROOM, R. (2009) Alcohol and infectious diseases: an overlooked causal linkage?, *Addiction*, 104, 331-2.
258. HELAKORPI, S., MAKELA, P. & UUTELA, A. (2010) Alcohol consumption before and after a significant reduction of alcohol prices in 2004 in Finland: were the effects different across population subgroups?, *Alcohol Alcohol*, 45, 286-92.
259. WORLD HEALTH ORGANIZATION, W. (2007) WHO expert committee on problems related to alcohol consumption 2007 (Geneva, Switzerland, World Health Organization).
260. BLUNCH, N. J., BLUNCH, N.H. (2009) Cross-cultural components of alcohol consumption in Ghana, Paper presented at the *Proceedings of the 14th Cross Cultural Research Conference*, Provo, UT: Bringham Young University.
261. PELTZER, K. & PENGPID, S. (2012) Alcohol use and health-related quality of life among hospital outpatients in South Africa, *Alcohol Alcohol*, 47, 291-5.
262. FALK, D. E., YI, H. Y. & HILTON, M. E. (2008) Age of onset and temporal sequencing of lifetime DSM-IV alcohol use disorders relative to comorbid mood and anxiety disorders, *Drug Alcohol Depend*, 94, 234-45.
263. THUN, M., PETO, R., BOREHAM, J. & LOPEZ, A. D. (2012) Stages of the cigarette epidemic on entering its second century, *Tob Control*, 21, 96-101.
264. KALICHMAN, S. C., PINKERTON, S. D., CAREY, M. P. et al. (2011) Heterosexual anal intercourse and HIV infection risks in the context of alcohol serving venues, Cape Town, South Africa, *BMC Public Health*, 11, 807.
265. KALICHMAN, S. C., SIMBAYI, L. C., CAIN, D. & JOOSTE, S. (2007) Alcohol expectancies and risky drinking among men and women at high-risk for HIV infection in Cape Town South Africa, *Addict Behav*, 32, 2304-10.
266. REHM, J. & PARRY, C. (2009) Alcohol consumption and infectious diseases in South Africa, *Lancet*, 374, 2053.
267. CHOI, N. G. & DINITTO, D. M. (2011) Drinking, smoking, and psychological distress in middle and late life, *Aging & mental health*, 15, 720-31.
268. FAGERSTROM, K. O., KUNZE, M., SCHOBERBERGER, R. et al. (1996) Nicotine dependence versus smoking prevalence: comparisons among countries and categories of smokers, *Tob Control*, 5, 52-6.
269. BITTON, A., GREEN, C. & COLBERT, J. (2011) Improving the delivery of global tobacco control, *Mt Sinai J Med*, 78, 382-93.
270. TAGOE, H. A. & DAKE, F. A. (2011) Healthy lifestyle behaviour among Ghanaian adults in the phase of a health policy change, *Global Health*, 7, 7.
271. REHM, J., TAYLOR, B. & ROOM, R. (2006) Global burden of disease from alcohol, illicit drugs and tobacco, *Drug Alcohol Rev*, 25, 503-13.
272. WILLIS, J. (2006) Drinking Crisis? Change and continuity in cultures of drinking in sub-Saharan Africa, *African Journal of Drug and Alcohol Studies*, 5.
273. TUMWESIGYE, N. M., KYOMUHENDO, G. B., GREENFIELD, T. K. & WANYENZE, R. K. (2012) Problem drinking and physical intimate partner violence against women: evidence from a national survey in Uganda, *BMC Public Health*, 12, 399.

274. NELSON, J. P. (2001) Alcohol advertising and advertising bans: A survey of research methods, results and policy implications, *Advertising and Differentiated Products (Advances in Applied Microeconomics)*, 10, 239-295.
275. SWAHN, M. H., ALI, B., PALMIER, J. B., SIKAZWE, G. & MAYEYA, J. (2011) Alcohol marketing, drunkenness, and problem drinking among Zambian youth: findings from the 2004 Global School-Based Student Health Survey, *J Environ Public Health*, 2011, 497827.

PAPERS I-III

I

Martinez et al. BMC Public Health 2011, 11:160
http://www.biomedcentral.com/1471-2458/11/160

BMC Public Health

RESEARCH ARTICLE Open Access

Alcohol abstinence and drinking among African women: data from the World Health Surveys

Priscilla Martinez[1*], Jo Røislien[1,2], Nirmala Naidoo[3], Thomas Clausen[1]

Abstract

Background: Alcohol use is increasing among women in Africa, and comparable information about women's current alcohol use is needed to inform national and international health policies relevant to the entire population. This study aimed to provide a comparative description of alcohol use among women across 20 African countries.

Methods: Data were collected as part of the WHO World Health Survey using standardized questionnaires. In total, 40,739 adult women were included in the present study. Alcohol measures included lifetime abstinence, current use (≥1 drink in previous week), heavy drinking (15+ drinks in the previous week) and risky single-occasion drinking (5+ drinks on at least one day in the previous week). Country-specific descriptives of alcohol use were calculated, and K-means clustering was performed to identify countries with similar characteristics. Multiple logistic regression models were fitted for each country to identify factors associated with drinking status.

Results: A total of 33,841 (81%) African women reported lifetime abstinence. Current use ranged from 1% in Malawi to 30% in Burkina Faso. Among current drinkers, heavy drinking varied between 4% in Ghana to 41% in Chad, and risky single-occasion drinking ranged from <1% in Mauritius to 58% in Chad. Increasing age was associated with increased odds of being a current drinker in about half of the countries.

Conclusions: A variety of drinking patterns are present among African women with lifetime abstention the most common. Countries with hazardous consumption patterns require serious attention to mitigate alcohol-related harm. Some similarities in factors related to alcohol use can be identified between different African countries, although these are limited and highlight the contextual diversity of female drinking in Africa.

Background

Alcohol use is an important factor in any woman's health risk profile. Harmful patterns of alcohol consumption are strongly associated with increased morbidity and mortality [1]. Alcohol related morbidities include mental health disorders such as substance dependence and depression, and physical morbidities such as breast cancer, and HIV infection [2-5]. Women also experience unique negative social consequences of alcohol use that impact health, from increased risk of domestic violence and stigma [6,7]. The negative health and social consequences of alcohol use are further moderated by the volume of alcohol consumed and the pattern of use over time [8].

Alcohol use among women in Africa has traditionally been quite low, and high rates of lifetime abstention persist in many African countries [9]. However, population-based surveys have documented rates of alcohol use and harmful drinking among African women that raise concern, including episodic binge drinking and regular high consumption. Prevalence of alcohol use in the past-year among women was estimated at 30% in Bostwana and 47% in Namibia [9,10]. Heavy drinking was found in 38% of women currently drinking in Nigeria and 20% among current female drinkers in Uganda [11,12]. The negative consequences of harmful alcohol use are illustrated by studies that identify women's alcohol use as a risk factor for HIV infection in Uganda and South Africa [13,14]. From the limited evidence available, factors associated with alcohol use among women in low to middle income countries included being single, higher socio-economic status and higher levels of education [15-17].

* Correspondence: priscilla.martinez@medisin.uio.no
[1]Norwegian Center for Addiction Research, University of Oslo, Kirkeveien 166, 0450 Oslo, Norway
Full list of author information is available at the end of the article

BioMed Central

© 2011 Martinez et al; licensee BioMed Central Ltd. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

African countries are categorized as low to middle income, and as such are often limited alcohol-policy environments [18]. As observed in Thailand, such an environment coupled with increasing incomes resulted in pronounced increases in rates of drinking among young women [19]. The heavy influence of the alcohol industry on the development of national alcohol policies favorable to alcohol advertising and distribution has recently been documented in several African countries [20]. The combination of minimally regulated alcohol companies and increased commoditization of their products, along with higher levels of social tolerance towards female drinking predicates increases in the number of African women imbibing alcohol.

A recent study using data from the WHO's World Health Survey observed diverse patterns of drinking among 20 African countries, supporting the contention there is a variety of national drinking habits across the African continent [21]. This study, however, did not explicitly examine patterns of use among currently drinking women. Indeed, there is a paucity of research investigating African women's use of alcohol and associated factors at a country level, limiting our current knowledge of the different ways women consume alcohol in different African countries. This knowledge is important for gauging the expected increase in alcohol use by African women, and the inclusion of women's interests in the development of national health and alcohol policies.

The WHO's World Health Survey provided data on alcohol use and sociodemographics among women in 20 African countries [22]. Using this data, the present study provides a comparative description of alcohol use among women in Africa. We also aimed to identify broad similarities and differences in women's drinking behaviors across the 20 countries, and determine sociodemographic factors associated with current drinking levels and different drinking patterns by country.

Methods

Data collection

The data used for this study is publicly available from the WHO. Data were collected as part of the WHO World Health Survey (WHS) between 2002 and 2004 in 20 African countries [22]. Household samples were drawn from nationally representative sampling frames. A stratified, multi-stage cluster design was used where each household had a known non-zero probability of selection. One single respondent aged 18 years or above was randomly selected from each eligible household using Kish tables.

In total 77,165 adults aged 18 years and older were included, and of these, 40,739 (53%) were women. Response rates were reported at both the household and individual level and varied between 54 and 98% at the household level (median = 90%), and 85 and 99% at the individual level (median = 98%) [23].

The WHS used identical questionnaires for the face-to-face interviews in all 20 countries. Individual level data included sociodemographic variables such as marital status, education and employment. WHS protocols and procedures were approved by the ethics committees in each participating country and informed consent was obtained from all participants. The instruments and sampling designs are described in further detail elsewhere [23,24].

Alcohol data

The question "have you ever consumed a drink that contains alcohol?" was used to identify lifetime abstainers. If the respondent indicated positively, they were asked "how many standard drinks were consumed each day in the past 7 days". From this, we constructed three variables related to drinking: 'current drinkers' were defined as any respondent who consumed at least 1 standard drink in the previous 7 days; 'heavy drinkers' were defined as those who had consumed a total of 15 or more standard drinks during the last 7 days; and 'risky single-occasion drinkers' were defined as those who consumed at least 5 or more standard drinks of alcohol on at least one day of the previous week. Note these three variables are not mutually exclusive. A showcard with pictures was used to illustrate what was meant by a "standard drink", and defined by WHS as containing between 8-13 g of ethanol depending on the country.

Statistical analyses

All data were weighted, with post-stratification adjustments for age and gender using the UN population estimates as the reference population. Data were stratified by gender, and descriptive statistics presented as frequencies (%) or means (SD). Prevalences for the 'heavy drinker' and 'risky single-occasion drinker' variables are presented out of the total 'current drinker' group, unless otherwise specified. All the rates presented are weighted proportions.

In order to explore whether the 20 countries could be grouped into clusters based on similarities in percentages of the three drinking variables, i.e. 'lifetime abstainers', 'heavy drinkers' and 'risky single-occasion drinkers', we performed K-means clustering, averaging over 25 runs [25]. K-means clustering aims to divide a number of observations into a number of clusters where each observation belongs to the cluster with the nearest mean value(s) and the within-cluster variability is at a minimum. Only the 14 countries with values above 1% for 'heavy drinkers' and 'risky single-occasion drinkers'

were included in the K-means clustering analysis. Given this rather small sample size the robustness of the result of the clustering analysis was assessed by removing outliers and removing random data points, i.e. countries, and re-running the analysis in each case [26].

In order to assess possible predictors of the three constructed dependent variables 'current drinking', 'heavy drinking' and 'risky single-occasion drinking', we fitted separate multiple logistic regression models for each of the 14 countries with more than 30 current drinkers. Included explanatory variables in the regression analyses were age, any education or not, currently married or cohabitating, working for pay and rural setting. In order to assess the validity of the linearity assumption in Generalized Linear Models (GLM), e.g. logistic regression, we first fitted Generalized Additive Models (GAM). GAM is a natural extension of GLM allowing for all types of functional relationships between the dependent and the independent variables [27]. By visual inspection of the results from the GAM analyses, age was not linear with respect to the dependent variables in 7 of the 14 countries, but rather piecewise linear. That is, two linear segments separated by a *breakpoint*, where below and above this breakpoint age has different effects on the dependent variable. For the 7 countries where age showed a linear relation to the dependent variable we thus fitted standard multiple logistic regression analyses, whereas for the 7 countries where age showed a piecewise linear relationship to the dependent variable we fitted piecewise linear logistic regression models including estimates of the accompanying breakpoint [28].

Data analysis was performed in STATA 9.0 and R 2.9.0 [29,30].

Results

In total 33,841 (81%) of the African women from the 20 countries were lifetime abstainers, with rates ranging from 56% in Mauritius to 99% in Comoros (Table 1). A total of 3,592 (10%) women were current drinkers, with the highest national rate in Burkina Faso (30%) and the lowest in Tunisia (<0.1%). Of the entire sample, being a heavy drinker and a risky single-occasion drinker was observed among 584 (1%) and 713 (2%) of the women, respectively, with the highest proportions of heavy drinkers and risky single-occasion drinkers among current drinkers observed in Burkina Faso and Chad. In total, the proportion of risky single-occasion drinkers among heavy drinkers was 70%, ranging from 16% in Ethiopia to 92% in South Africa (data not shown).

In Comoros, Mali, Mauritania, Morocco, Senegal and Tunisia more than 95% of women were lifetime abstainers with fewer than 30 current drinkers in this sample. These six countries were thus excluded from further descriptive comparisons, cluster analysis and regression analysis of 'current drinkers', 'heavy drinkers' and 'risky single-occasion drinkers'.

Of the remaining 14 countries, current drinkers ranged from 1% in Malawi to 30% in Burkina Faso, where 12 countries had rates below 20%. Rates of heavy drinkers among current drinkers varied widely, from 4% in Ghana to 41% in Chad, and were below 20% in 12 countries. Rates of risky single-occasion drinkers among current drinkers were below 20% in 9 countries, and ranged from <1% in Mauritius to 19% in Swaziland, whereas those with rates above 20% ranged from 28% in Zambia to 58% in Chad.

K-means clustering of the three drinking variables produced four clusters of countries (Figure 1); the first cluster included countries with low- to mid-range percentages of lifetime abstainers (56%-73%) and few heavy drinkers and risky single-occasion drinkers (4%-7% and 2%-7%, respectively) and was labeled "moderate consumption countries"; the second cluster included countries with a mid- to high-level range of lifetime abstinence (60%-93%) and somewhat more heavy drinkers and risky single-occasion drinkers (5%-12% and 12%-19%, respectively) and was labeled "harmful consumption countries"; the third cluster was also made up of countries with a mid- to high-level range of lifetime abstention (64% to 93%), but with higher heavy drinker and risky single-occasion drinker rates (12%-34% and 28%-36%, respectively) and thus labeled "hazardous consumption countries"; the fourth and final cluster represents Chad only, which has a moderate lifetime abstention rate of 79% and is a high outlier on the proportion of heavy drinkers and risky single-occasion drinkers (41% and 58%, respectively). Of the 14 countries included, 4 were in the "moderate consumption" cluster, 5 in the "harmful consumption" cluster and 4 in the "hazardous consumption" cluster.

Sociodemographic variables by current drinker status for each of the 20 countries are presented in Table 2. Current drinkers in all countries were either roughly the same age or older than lifetime abstainers, except for Congo. For all countries except Swaziland, an equal or higher proportion of current drinkers were working for pay than lifetime abstainers.

In multiple logistic regression analyses to identify factors associated with being a current drinker, increasing age was associated with increased odds in 9 of the 14 countries (Table 3). In countries with a piecewise linear relationship between age and current drinker status, the breakpoint for the change of the effect of age ranged from 33 to 54 (median = 49). In 4 of these countries, an increase in age was significantly associated with increased odds of being a current drinker before the breakpoint only; for ages above the breakpoint increasing age was not associated with increased odds of being

Table 1 Patterns of drinking among adult women in 20 African countries

Country	n	Lifetime abstainers (%)*	Current drinkers (%)*	Heavy drinkers (%)**	Risky single-occasion drinkers (%)**
Burkina Faso	2543	64.4	29.5	33.5	31.0
Chad	2435	79.0	17.0	41.3	57.5
Comoros	969	99.9	-	-	-
Congo	1185	59.4	18.9	5.2	15.3
Cote d'Ivoire	1339	73.0	12.1	7.1	6.9
Ethiopia	2535	64.1	19.1	5.3	1.8
Ghana	2159	63.0	12.9	4.4	3.3
Kenya	2537	89.5	4.1	14.0	12.4
Malawi	3082	92.8	1.0	11.5	36.4
Mali	1749	95.8	2.5	8.6	22.4
Mauritania	2193	97.7	-	-	-
Mauritius	2016	56.1	11.8	0.9	0.3
Morocco	2926	99.8	0.0	-	-
Namibia	2379	69.8	22.5	12.1	17.8
Senegal	1223	97.7	1.0	13.0	21.4
South Africa	1228	82.0	13.5	15.6	30.5
Swaziland	1189	92.6	5.0	8.8	18.5
Tunisia	2411	99.8	-	-	-
Zambia	2088	85.8	5.9	17.7	27.6
Zimbabwe	2553	90.8	3.4	7.2	18.3

*% of total.

**% of current drinkers.

- weighted proportion estimates excluded for countries with 5 or less current drinkers.

a current drinker. Of the 5 countries for which having any education was a statistically significant predictor, it decreased the odds of being a current drinker except in Chad. Working for pay was significantly associated with an increased odds of being a current drinker in Mauritius, Chad and Ghana, while being married/cohabitating was associated with a decreased odds of being a current drinker in 4 of the 5 countries for which it was statistically significant. Living in a rural setting was also associated with a decreased odds of being a current drinker in 2 of the 3 countries for which it was statistically significant.

Regression analysis with heavy drinker and risky single-occasion drinker as the dependent variable revealed very few statistically significant covariates (data not shown).

There were no consistent patterns in the significance, magnitude or direction of the covariates within the country clusters generated by the K-means clustering.

Discussion

Our findings show widespread lifetime abstention from alcohol use among women in 20 African countries, limited though existing heavy and risky single-occasion drinking, and no firm geographic distribution of drinking patterns across the countries examined. Among currently drinking women our findings show moderate alcohol consumption is the most common pattern, and being a risky single-occasion drinker is more common than being a heavy drinker. The results further indicate drinking increases with age in several countries, where in some countries it clearly stabilizes or declines after mid-life.

The predominance of lifetime abstention from alcohol support female drinking is not a common or accepted part of African culture, likely due to religion, cultural tradition and gender roles [31]. This "alcohol naivete" presents an opportunity to establish and promote healthy drinking habits among the vast majority of African women. In Europe, the pattern of drinking in a population has been shown to be stable over time even when total consumption varies [32]. If also true in Africa, establishing healthy patterns of alcohol consumption among the majority of women would serve the public health of African countries far into the future. This effort would be particularly relevant and timely given the current expansion of the alcohol industry in Africa. Women are a large portion of the population available for recruitment into regular drinking and will also benefit from improved economic situations, creating a "perfect storm" for an increase in alcohol use and related harm [33]. Such circumstances and increases in hazardous drinking

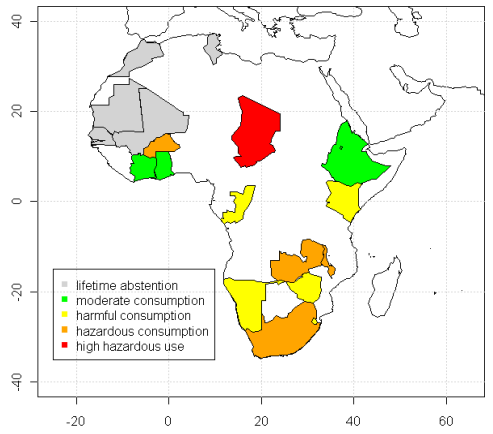


Figure 1 Geographical distribution of clusters from K-means clustering analysis labeled by drinking pattern and countries with high lifetime alcohol abstention.

among women have already been observed in Brazil and India [34]. While these observations are not directly applicable to Africa due to the difference in context and there are no direct reports of increased harmful use among women due specifically to improved economic status and increased alcohol availability in Africa, documentation of increased use and a report of weak alcohol policies suggest this scenario possible in many African countries [11,13,15,20]. These observations and the potential of such in Africa lend support for calls encouraging national action through global coordination and an international health policy [35].

Risky single-occasion drinking as the more common pattern of harmful use highlights the need for evidence-based, cost-effective interventions to avoid the development of alcohol related harm in countries where hazardous drinking patterns are observed. Indeed, there have already been calls from the WHO for Africa to address the harmful use of alcohol, and concerns from South Africa and Uganda about hazardous drinking habits among their female citizens [36-38].

The clusters of countries classified with "moderate consumption", "harmful consumption" and "hazardous consumption", with Chad in a position on its own, provide further evidence different types of drinking behaviors are present among female drinkers in Africa and a diversity of drinking patterns is common across the African continent. While there may be similar rates of a single drinking pattern between clusters, rates of the other drinking measures may be quite different, and these differences would have implications for differences in national and regional alcohol policies and interventions. The countries with the highest lifetime abstention rates, which were excluded from the cluster analysis, are located in the northern part of Africa and are predominantly Muslim. These results are consistent with other studies and the Islamic doctrine [9,21]. However, this does not apply to all the countries with high lifetime abstention rates, e.g. Zimbabwe or Malawi; these countries are neither predominantly Muslim nor located in northern Africa. No other consistent geographic distribution of countries by cluster are evident, highlighting the importance of local culture and tradition on female drinking behavior, and limited transfer of drinking habits across country borders.

Sociodemographic factors associated with current drinking varied across the 14 countries analysed, further reflecting the contextual diversity of alcohol use among African women. Older age was significantly associated with current drinking in 8 countries, potentially reflecting higher levels of independence and authority conferred by older age. The significant, non-linear relationship between age and current drinking observed in 5 countries is consistent with the idea of changes in drinking behavior over the lifespan, where drinking increases as age increases and then stabilizes or decreases around midlife. This dynamic association indicates the opportunity for prevention interventions among younger age groups.

Having any education reduced the likelihood of current drinking in four of the five countries for which it was statistically significant save Chad. This finding is inconsistent with studies from Europe that observe an association between higher levels of education and drinking among women [17,39]. However, this association is reasonable given the differences in context and availability of education between Europe and Africa as a whole. Women receiving *any* education in Africa likely represent a different demographic than those receiving any or higher education in a Western context.

Working for pay was significantly associated with an increase in current drinking in Mauritius, Chad and Ghana. Not being married or cohabitating increased the likelihood of current drinking for four of the five countries for which it was statistically significant. Having one's own disposable income and being single have been identified as factors in women's alcohol consumption in resource rich and resource poor settings, and these factors may become more common and pertinent with economic development [40].

The lack of consistent, significant associations between sociodemographic factors across all the countries and within the country clusters emphasizes the importance of local, tailored alcohol assessments in each country to ensure relevance and utility.

Table 2 Selected sociodemographics by drinking status among women in 14 African contries

Country n		Age Mean (SD)	Any education (%)	Working for pay (%)	Married/ cohabitating (%)	Rural setting (%)
Burkina Faso						
current drinkers	669	39.6 (15.1)	7.4	34.3	82.2	91.7
lifetime abstainers	1699	34.1 (13.6)	9.8	34.6	88.7	82.3
Chad						
current drinkers	358	35.6 (13.1)	23.6	59.3	71.8	82.7
lifetime abstainers	1986	34.6 (14.8)	14.4	49.3	77.1	80.2
Congo						
current drinkers	248	33.4 (12.3)	92.9	40.7	59.3	6.8
lifetime abstainers	721	35.3 (14.8)	84.0	34.0	46.9	6.3
Cote d'Ivoire						
current drinkers	146	38.2 (14.3)	52.0	51.8	53.0	35.1
lifetime abstainers	1025	34.2 (14.0)	53.9	48.6	56.2	30.3
Ethiopia						
current drinkers	465	37.2 (15.6)	19.4	39.9	68.7	90.6
lifetime abstainers	1655	34.8 (14.8)	38.5	32.6	65.3	87.3
Ghana						
current drinkers	303	42.7 (15.8)	58.8	86.5	66.1	66.0
lifetime abstainers	1334	39.2 (16.6)	61.2	77.0	59.1	53.4
Kenya						
current drinkers	134	40.7 (17.1)	66.5	64.1	58.0	67.3
lifetime abstainers	2216	34.6 (14.1)	87.1	50.4	64.9	83.0
Malawi						
current drinkers	45	52.0 (14.1)	66.3	44.7	41.8	94.1
lifetime abstainers	2851	34.0 (15.5)	68.4	33.1	69.2	91.4
Mauritius						
current drinkers	244	42.9 (14.0)	90.4	42.9	74.2	51.2
lifetime abstainers	1112	41.6 (15.9)	88.3	31.4	66.0	55.5
Namibia						
current drinkers	494	38.3 (16.4)	73.2	25.0	31.0	70.9
lifetime abstainers	1681	38.2 (18.1)	79.6	25.7	33.3	62.0
South Africa						
current drinkers	168	42.3 (17.8)	86.3	33.3	36.4	36.8
lifetime abstainers	999	37.7 (15.5)	91.6	31.7	35.9	46.1
Swaziland						
current drinkers	59	50.6 (14.9)	33.3	10.6	70.4	85.9
lifetime abstainers	1108	37.5 (16.1)	78.1	22.5	51.5	73.5
Zambia						
current drinkers	115	42.2 (17.6)	73.3	54.9	56.2	53.5
lifetime abstainers	1799	34.0 (15.5)	79.3	45.7	58.2	65.5
Zimbabwe						
current drinkers	85	44.9 (15.3)	82.0	20.0	68.3	61.2
lifetime abstainers	2346	35.9 (15.6)	88.8	19.5	59.8	60.7

Methodological considerations

The estimates of being a current drinker, risky single-occasion drinker and heavy drinker are likely underestimates of the true value. Stigma, religious beliefs, social norms and gender roles may contribute to the underreporting of alcohol use [41]. Conversely, these same reasons may lead to the overreporting of lifetime abstention. There may also be reduced recall of lifetime consumption when alcohol use among women is socially sanctioned at infrequent but common festivities, e.g. birthdays. We have no means of adjusting for potential under- or over-reporting of alcohol consumption, or

Table 3 Multiple logistic and piecewise regression results for current drinking among women in 14 African countries

Countries with linear effect of age	Age OR (95% CI)	Any education OR (95% CI)	Working for pay OR (95% CI)	Married/co-habiting OR (95% CI)	Rural setting OR (95% CI)
Congo	1.00 (0.98-1.01)	2.01 (0.83-4.87)	1.30 (0.59-2.89)	1.41 (0.89-2.22)	1.05 (0.76-1.46)
Ethiopia	1.00 (0.99-1.01)	0.39 (0.28-0.57)***	1.28 (0.95-1.71)	0.76 (0.61-0.96)*	1.00 (0.78-1.36)
Malawi	1.05 (1.04-1.07)*	2.13 (0.85-5.39)	1.45 (0.72-2.94)	0.55 (0.27-1.10)	1.11 (0.74-1.68)
Mauritius	1.02 (1.00-1.03)**	1.31 (0.68-2.53)	1.74 (1.26-2.42)***	1.55 (1.06-2.25)*	0.92 (0.68-1.25)
South Africa	1.01 (0.99-1.02)	0.66 (0.38-1.14)	1.32 (0.93-1.88)	1.21 (0.86-1.70)	0.84 (0.71-0.99)*
Zambia	1.04 (1.02-1.05)***	1.00 (0.53-1.88)	1.50 (0.90-2.50)	1.05 (0.63-1.75)	0.71 (0.54-0.92)*
Zimbabwe	1.04 (1.02-1.06)***	1.07 (0.54-2.12)	1.19 (0.62-2.29)	1.60 (0.92-2.78)	0.87 (0.63-1.21)
Countries with piecewise linear effect of age	**OR (95% CI) before breakpoint** **OR (95% CI) after breakpoint** ***Age at breakpoint (95% CI)***				
Burkina Faso	1.03 (1.02-1.05) *** 0.99 (0.96-1.03) *53 (38-69)*	1.22 (0.88-1.69)	1.13 (0.90-1.41)	0.70 (0.53-0.94)*	2.39 (1.85-3.08)***
Chad	1.03 (0.99-1.06) 0.95 (0.93-0.97) *37 (29-46)*	2.33 (1.62-3.35)***	1.68 (1.24-2.27) ***	0.53 (0.38-0.75) ***	1.42 (0.96-2.12)
Cote d'Ivoire	1.04 (1.01-1.08) * 0.99 (0.94-1.03) *49 (32-65)*	1.26 (0.78-2.02)	0.92 (0.59-1.43)	0.76 (0.48-1.20)	1.33 (0.84-2.09)
Ghana	1.02 (1.00-1.04) * 0.99 (0.97-1.02) *51 (28-74)*	0.85 (0.62-1.15)	2.00 (1.29-3.12)**	0.92 (0.69-1.24)	1.29 (0.97-1.73)
Kenya	1.08 (0.99-1.19) 0.99 (0.97-1.01) *33 (21-45)*	0.43 (0.26-0.69)***	0.98 (0.65-1.47)	0.76 (0.51-1.15)	0.76 (0.50-1.17)
Namibia	1.03 (1.00-1.05) 0.97 (0.95-0.98) ** *41 (34-48)*	0.59 (0.43-0.79)***	1.05 (0.82-1.34)	0.66 (0.52-0.84)***	1.18 (0.94-1.48)
Swaziland	1.06 (1.02-1.10)** 0.98 (0.92-1.05) 54 (36-72)	0.43 (0.20-.92)*	0.90 (0.40-2.05)	0.76 (0.39-1.51)	1.53 (0.61-3.83)

*p ≤ 0.05; **p ≤ 0.01 ***p ≤ 0.001.

whether this source of potential misclassification is equally distributed between the included countries. Also, the volume of alcohol consumed was self-reported and may add to variation in the number of "standard drinks" consumed. Both volume and concentration of alcohol consumed may be especially difficult to estimate where homebrews are common. The reported prevalences of all drinking patterns for all countries should thus be read with caution.

The current drinker, heavy drinker and risky single-occasion drinker measures were based on a 1-week recall which may increase the precision of the amount of drinks consumed but compromise the accuracy of the measurement of women who are true "current drinkers", "heavy drinkers " or " risky single-occasion drinkers", as a 7-day recall may not necessarily reflect typical drinking behavior. Moreover, this sample contained no data on women who reported ever having a drink but no consumption in the last week, excluding a group of potential "current" drinkers, or heavy or risky-single occasion drinkers who did not drink in the previous week. Finally, no personal income variable was available in this dataset, and as noted, income is an important factor to consider in women's drinking behavior and should be purposefully included in future studies. Indeed, any variables measuring context-specific aspects of African women's use of alcohol would be useful.

This paper nonetheless has important value as it covers more than a third of African countries and contributes important knowledge for describing the drinking behavior of women in Africa, and can serve as a baseline against which to measure drinking patterns in the future.

Conclusions

A variety of drinking patterns are present among African women with lifetime abstention being the most common. The identification of countries with hazardous consumption patterns demands immediate and serious attention to avoid and mitigate alcohol-related harm. Some similarities in factors related to alcohol use can be identified between different African countries, although these are limited and diversity prevails. Further

investigations are required to understand the country-specific context of female drinking in Africa and to tailor national alcohol policies.

Acknowledgements
We would like to express our thanks to each data collection team in the participating countries, Paul Kowal [WHO] for helpful comments during manuscript preparation and the reviewers for their extremely constructive critiques.

Author details
[1]Norwegian Center for Addiction Research, University of Oslo, Kirkeveien 166, 0450 Oslo, Norway. [2]Department of Biostatistics, Institute of Basic Medical Sciences, University of Oslo, P.O. Box 1122 Blindern, N-0317 Oslo, Norway. [3]Department of Health Statistics and Informatics, World Health Organization, Avenue Appia 20, 1211 Geneva 27, Switzerland.

Authors' contributions
PM, TC and NN contributed to the design of the study. NN contributed to data collection and data management. PM led the writing and carried out statistical analysis. JR contributed to the statistical design and analysis. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Received: 21 September 2010 Accepted: 10 March 2011
Published: 10 March 2011

References

1. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J: **Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders.** *Lancet* 2009, **373(9682)**:2223-33.
2. Piazza NJ, Vrbka JL, Yeager RD: **Telescoping of alcoholism in women alcoholics.** *Int J Addict* 1989, **24(1)**:19-28.
3. Marmorstein NR: **Longitudinal associations between alcohol problems and depressive symptoms: early adolescence through early adulthood.** *Alcohol Clin Exp Res* 2009, **33(1)**:49-59.
4. Hulka BS, Moorman PG: **Breast cancer: hormones and other risk factors.** *Maturitas* 2008, **61(1-2)**:203-13.
5. Shuper PA, Neuman M, Kanteres F, Baliunas D, Joharchi N, Causal JRehm: **Considerations on Alcohol and HIV/AIDS – A Systematic Review.** *Alcohol Alcohol* 2010, **45(2)**:159-166.
6. Schnitzer S, Bellis MA, Anderson Z, Hughes K, Calafat A, Juan M, Kokkevi A: **Nightlife violence: a gender-specific view on risk factors for violence in nightlife settings: a cross-sectional study in nine European countries.** *J Interpers Violence* .
7. Zemore SE, Mulia N, Yu Ye, Borges G, Greenfield TK: **Gender, acculturation, and other barriers to alcohol treatment utilization among Latinos in three National Alcohol Surveys.** *J Subst Abuse Treat* 2009, **36**:446-56.
8. Rehm J, Room R, Graham K, Monteiro M, Gmel G, Sempos CT: **The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview.** *Addiction* 2003, **98**:1209-28.
9. WHO: **Global Status Report on Alcohol 2004.** Geneva: World Health Oganization; 2004.
10. Weiser SD, Leiter K, Heisler M, McFarland W, Percy-de Korte F, DeMonner SM, Tlou S, Nthabiseng P, Iacopino V, Bangsberg DR: **A population-based study on alcohol and high-risk sexual behaviors in Botswana.** *PLoS Med* 2006, **3**:e392.
11. Ibanga A, Adetula AV, Dagona Z, Karick H, Ojiji O: **The contexts of alcohol consumption by men and women in Nigeria.** In *Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries*.. 1 edition. Edited by: Obot I and Room R. Geneva: World Health Organization; 2005:143-66.
12. Tumwesigye NM, Kasirye R: **Gender and the major consequences of alcohol consumption in Uganda.** In *Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries*.. 1 edition. Edited by: Obot I and Room R. Geneva: World Health Organization; 2005:189-208.
13. Zablotska IB, Gray RH, Koenig MA, Serwadda D, Nalugoda F, Kigozi G, Sewankambo N, Lutalo T, Wabwire Mangen F, Wawer M: **Alcohol use, intimate partner violence, sexual coercion and HIV among women aged 15-24 in Rakai, Uganda.** *AIDS Behav* 2009, **13**:225-33.
14. Chersich MF, Rees HV: **Vulnerability of women in southern Africa to infection with HIV: biological determinants and priority health sector interventions.** *AIDS* 2008, **22(suppl)**:27-40.
15. Mbatia J, Jenkins R, Singleton N, White B: **Prevalence of alcohol consumption and hazardous drinking, tobacco and drug use in urban Tanzania, and their associated risk factors.** *Int J Environ Res Public Health* 2009, **6**:1991-2006.
16. Almeida-Filho N, Lessa I, Magalhães L, Araújo MJ, Aquino E, James SA, Kawachi I: **Social inequality and alcohol consumption-abuse in Bahia, Brazil– interactions of gender, ethnicity and social class.** *Soc Psychiatry Psychiatr Epidemiol* 2005, **40**:214-22.
17. Bloomfield K, Grittner U, Kramer S, Gmel G: **Social inequalities in alcohol consumption and alcohol-related problems in the study countries of the EU concerted action 'Gender, Culture and Alcohol Problems: a Multi-national Study'.** *Alcohol Alcohol* 2006, **41(Suppl)**:26-36.
18. The World Bank Group: **World Bank list of economies (July 2009).** 2009.
19. Thamarangsi T: **Thailand: alcohol today.** *Addiction* 2006, **101**:783-7.
20. Bakke O, Endal D: **Vested interests in addiction research and policy alcohol policies out of context: drinks industry supplanting government role in alcohol policies in sub-Saharan Africa.** *Addiction* 2010, **105**:22-8.
21. Clausen T, Rossow I, Naidoo N, Kowal P: **Diverse alcohol drinking patterns in 20 African countries.** *Addiction* 2009, **104**:1147-54.
22. Ustun TB, Chatterjee S, Mechbal A, Murray CJL: **Health Systems Performance Assessment: Debates, Methods, and Empiricism.** In *WHS Collaborating Groups, The World Health Surveys.* Edited by: Murray CJ, Evans DB. Geneva: World Health Organization; 2003:797-808.
23. **World Health Survey Results.** [http://www.who.int/healthinfo/survey/whsresults/en/index1.html].
24. **World Health Survey.** [http://www.who.int/healthinfo/survey/en/].
25. Hartigan JA, Wong MA: **Algorithm AS 136: A K-Means Clustering Algorithm.** *J Royal Stat Soc Series C (Applied Statistics)* 1979, **28**:100-8.
26. Steinley D: **K-means clustering: a half-century synthesis.** *Br J Math Stat Psychol* 2006, **59(Pt 1)**:1-34.
27. Wood SN: **Generalized Additive Models: An Introduction with R.** Boca Raton, FL: Chapman & Hall/CRC; 2006.
28. Muggeo VM: **Estimating regression models with unknown break-points.** *Stat Med* 2003, **22(19)**:3055-71.
29. **Stata Statistical Software: Release 9.** College Station, TX: StataCorp LP; 2005.
30. **R: A Language and Environment for Statistical Computing.** Vienna, Austria: R Foundation for Statistical Computing; 2008.
31. Wilsnack RW, Wilsnack SC, Obot IA: **Why study gender, alcohol and culture?** In *Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries*.. 1 edition. Edited by: Obot I, Room R. Geneva: World Health Organization; 2005:1-23.
32. Skog OJ, Rossow I: **Flux and stability: individual fluctuations, regression towards the mean and collective changes in alcohol consumption.** *Addiction* 2006, **101**:959-70.
33. Caetano R, Laranjeira R: **A 'perfect storm' in developing countries: economic growth and the alcohol industry.** *Addiction* 2006, **101**:149-52.
34. Prasad R: **Alcohol use on the rise in India.** *Lancet* 2009, **373**:17-8.
35. Casswell S, Thamarangsi T: **Reducing harm from alcohol: call to action.** *Lancet* 2009, **373**:2247-57.
36. **WHO urges Africa to check harmful use of alcohol.** [http://www.afro.who.int/en/media-centre/pressreleases/194-who-urges-africa-to-check-harmful-use-of-alcohol.html].
37. Seedat M, Van Niekerk A, Jewkes R, Suffla S, Ratele K: **Violence and injuries in South Africa: prioritising an agenda for prevention.** *Lancet* 2009, **374**:1011-22.
38. Namagembe I, Jackson LW, Zullo MD, Frank SH, Byamugisha JK, Sethi AK: **Consumption of alcoholic beverages among pregnant urban Ugandan women.** *Matern Child Health J* 2010, **14**:492-500.
39. Helakorpi S, Makela P, Uutela A: **Alcohol consumption before and after a significant reduction of alcohol prices in 2004 in Finland: were the effects different across population subgroups?** *Alcohol Alcohol* 2010.

40. WHO: **WHO expert committee on problems related to alcohol consumption 2007.** Geneva: World Health Organization; 2007.
41. Michalak L, Trocki K: **Comments on surveying alcohol in Africa.** *Addiction* 2009, **104**:11556.

Pre-publication history
The pre-publication history for this paper can be accessed here:
http://www.biomedcentral.com/1471-2458/11/160/prepub

doi:10.1186/1471-2458-11-160
Cite this article as: Martinez *et al.*: Alcohol abstinence and drinking among African women: data from the World Health Surveys. *BMC Public Health* 2011 **11**:160.

Submit your next manuscript to BioMed Central and take full advantage of:

- **Convenient online submission**
- **Thorough peer review**
- **No space constraints or color figure charges**
- **Immediate publication on acceptance**
- **Inclusion in PubMed, CAS, Scopus and Google Scholar**
- **Research which is freely available for redistribution**

Submit your manuscript at
www.biomedcentral.com/submit

BioMed Central

II

III

APPENDIX I

WORLD HEALTH SURVEY

2002

B – Individual Questionnaire

Rotation - A

World Health Organization, Evidence and Information for Policy

WORLD HEALTH SURVEY

INDIVIDUAL QUESTIONNAIRE

CONTENTS

WORLD HEALTH SURVEY

0990. Individual Consent Form

Dear Participant,

You have been randomly selected to be part of this survey and we would, therefore, like to interview you. This survey is conducted by the World Health Organization and will be carried out by professional interviewers from (name of institution). This survey is currently taking place in several countries around the world.

The information you provide will only be used to understand the main things that affect peoples' health in different countries and how people view their own health and access to health services.

The interview will take approximately 60 minutes. I will ask you questions about:

- some personal details,
- your health including activities that you generally carry out,
- any health problems you have experienced and treatment you may have received,
- the health care centres you use and how well these have responded to your needs.

The information you provide is totally confidential and will not be disclosed to anyone. It will only be used for research purposes. Your name, address, and other personal information will be removed from the questionnaire, and only a code will be used to connect your name and your answers without identifying you. The Survey Team may contact you again only if it is necessary to complete the information on the survey.

Your participation is voluntary and you can withdraw from the survey after having agreed to participate. You are free to refuse to answer any question that is asked in the questionnaire. If you have any questions about this survey you may ask me or contact (name of institution and contact details) or (Principal Investigator at site).

Signing this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

Q0990. Who was the Individual Consent Form read by? 1. Read by Respondent [ ] 2. Read by Interviewer [ ]

Q0991. Was the Individual Consent Form Agreed to and Signed / but Not Signed or Refused? 1. Agreed and Signed [ ] 2. Agreed but Not Signed [ ] 7. Refused [ ]

Respondent: _____

Interviewer: _____ Date: ___ / ___ / ___

1000. Respondent's Socio Demographic Characteristics

Time Begin: __ __ : __ __

I would like to start by asking you some background questions before asking you questions on your health. This information is confidential and will only be used for research purposes.

Q1000	**What is your mother tongue?**			
Q1001	**Record sex as observed**	**1.** Female	**2.** Male	
Q1002	How old are you? (Years)	_____	**888.** DK	If age is known: Go to Q1004
Q1003	If you don't know/don't want to tell me your age could you tell me the age range if I read the different options to you **(choose what is most appropriate)** ? (**READ THE OPTIONS TO THE RESPONDENT)**	**1.** 18-19 **2.** 20-29 **3.** 30-39 **4.** 40-49 **5.** 50-59 **6.** 60-69 **7.** 70+		
Q1004	Your weight in Kilos?	_____		If weight is in kilos: Go to Q1006
Q1005	Your weight in Pounds?	_____		
Q1006	Your height in Centimeters	_____		If height is in centimeters: Go to Q1008
Q1007	Your height in Feet / Inches	_____		

Q1008	What is your current marital status?	**1.** Never Married	**2.** Currently Married	**3.** Separated	**4.** Divorced	**5.** Widowed	**6.**Cohabiting

Q1009	What is the highest level of education that you have completed?	**1.** No formal schooling **2.** Less than primary school **3.** Primary school completed **4.** Secondary school completed **5.** High school (or equivalent) completed **6.** College / pre-university / University completed **7.** Post graduate degree completed
Q1010	How many years of school, including higher education have you completed?	_____

Q1011	What is your ***[ethnic group / racial group / cultural subgroup / others]*** background? ***Each country to substitute appropriate phrases or terms and list the relevant response options.***	_____

Now, I would like to ask you a few questions about your work status.

Q1012	What is your current job?	**1.** Government employee	**2.** Non-government employee	**3.** Self-employed	**4.** Employer	**5.** Not working for pay	If not working for pay: Go to Q1014

Q1013	During the last 12 months, what has been your main occupation?	**1.** Legislator, Senior Official, or Manager	Go to Section 2000
		2. Professional (engineer, doctor, teacher, clergy, etc.)	
		3. Technician or Associate Professional (inspector, finance dealer, etc.)	
		4. Clerk (secretary, cashier, etc.)	
		5. Service or sales worker (cook, travel guide, shop salesperson, etc.)	
		6. Agricultural or fishery worker (vegetable grower, livestock producer, etc.)	
		7. Craft or trades worker (carpenter, painter, jewelry worker, butcher, etc.)	
		8. Plant/machine operator or assembler (equipment assembler, sewing-machine operator, driver, etc.)	
		9. Elementary worker (street food vendor, shoe cleaner, etc.)	
		10. Armed forces (government military)	

Q1014	What is the main reason you are not working for pay?	**1.** Homemaker / caring for family
		2. Looked but can't find a job
		3. Doing unpaid work / voluntary activities
		4. Studies / training
		5. Retired / too old to work
		6. Ill health
		7. Other

Time End: __ ___: __ __

2000. Health State Descriptions

Time Begin: __ __ : __ __

Overall Health

The first questions are about your overall health, including both your physical and your mental health.

Q2000	In general, how would you rate your health today?	**1.** Very good	**2.** Good	**3.** Moderate	**4.** Bad	**5.** Very Bad
Q2001	Overall in the last 30 days, how much difficulty did you have with work or household activities?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Now I would like to review different functions of your body. When answering these questions, I would like you to think about the last 30 days, taking both good and bad days into account. When I ask about difficulty, I would like you to consider how much difficulty you have had, on an average, in the past 30 days, while doing the activity in the way that you usually do it. By difficulty I mean requiring increased effort, discomfort or pain, slowness or changes in the way you do the activity. Please answer this question taking into account any assistance you have available. (**Read and show scale to respondent).**

Mobility

Q2010	Overall in the last 30 days, how much difficulty did you have with moving around?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do
Q2011	In the last 30 days, how much difficulty did you have in vigorous activities, such as running 3 km (or equivalent) or cycling?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Self Care

Q2020	Overall in the last 30 days, how much difficulty did you have with self-care, such as washing or dressing yourself?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do
Q2021	In the last 30 days, how much difficulty did you have in taking care of and maintaining your general appearance (e.g. grooming, looking neat and tidy etc.)	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Pain and Discomfort

Q2030	Overall in the last 30 days, how much of bodily aches or pains did you have?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme
Q2031	In the last 30 days, how much bodily discomfort did you have?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme

Cognition

Q2050	Overall in the last 30 days, how much difficulty did you have with concentrating or remembering things?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Q2051	In the last 30 days, how much difficulty did you have in learning a new task (for example, learning how to get to a new place, learning a new game, learning a new recipe etc.)?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Interpersonal Activities

Q2060	Overall in the last 30 days, how much difficulty did you have with personal relationship or participation in the community?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do
Q2061	In the last 30 days, how much difficulty did you have in dealing with conflicts and tensions with others?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Vision

Q2070	Do you wear glasses or contact lenses? **(If Respondent says YES to this question, preface the next 2 questions with "Please answer the following questions taking into account your glasses or contact lenses".)**	**1.** Yes			**5.** No	
Q2071	In the last 30 days, how much difficulty did you have in seeing and recognizing a person you know across the road (i.e. from a distance of about 20 meters)?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do
Q2072	In the last 30 days, how much difficulty did you have in seeing and recognizing an object at arm's length or in reading?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme/ Cannot do

Sleep and Energy

Q2080	Overall in the last 30 days, how much of a problem did you have with sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme
Q2081	In the last 30 days, how much of a problem did you have due to not feeling rested and refreshed during the day (e.g. feeling tired, not having energy)?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme

Affect

Q2090	Overall in the last 30 days, how much of a problem did you have with feeling sad, low or depressed?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme
Q2091	Overall in the last 30 days, how much of a problem did you have with worry or anxiety?	**1.** None	**2.** Mild	**3.** Moderate	**4.** Severe	**5.** Extreme

4000. RISK FACTORS

Time Begin: __ __ : __ __

Tobacco

(Show Tobacco list to respondent ----see Appendix A4.1)

Q4000	Do you currently smoke any tobacco products such as cigarettes, cigars, or pipes?	**1.** Daily	**2.** Yes, but not daily	**5.** No, not at all	If 2 or No: Go to Q4010
Q4001	For how many years are you smoking daily?	_____			

On average, how many of the following products do you smoke each day?

Q4002	Manufactured cigarettes	_____
Q4003	Hand-rolled cigarette	_____
Q4004	Pipefuls of tobacco	_____
Q4005	Other:	_____

Alcohol

(Show Alcohol card to respondent ----see Appendix A4.2)

Q4010	Have you ever consumed a drink that contains alcohol (such as beer, wine, etc.)?	**1.** Yes	**5.** Never	If Never: Go to Q4020

During the past 7 days, how many standard drinks of any alcoholic beverage did you have each day?

Q4011	Monday	_____
Q4012	Tuesday	_____
Q4013	Wednesday	_____
Q4014	Thursday	_____
Q4015	Friday	_____
Q4016	Saturday	_____
Q4017	Sunday	_____

Nutrition

Now I am going to ask you about the fruit and vegetables you usually eat. **(Show Nutrition card to respondent ---- see Appendix A4.3)**

Q4020	How many servings of fruit do you eat on a typical day?	_____
Q4021	How many servings of vegetables do you eat on a typical day?	_____

Physical Activity

Now I am going to ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your house and yard work, to get from places to place, and in your spare time for recreation, exercise or sport.

Q4030	**Vigorous Activity** Now, think about all the vigorous activities which take hard physical effort that you did in the last 7 days. Vigorous activities make you breathe much harder than normal and may include heavy lifting, digging, aerobics, or fast bicycling. Think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on **how many days** did you do vigorous physical activities? **(Show Physical Activity card to respondent ---- see Appendix A4.4)**	_____	If No: Go to Q4033

How much time did you usually spend doing **vigorous physical activities** on one of those days?

Q4031	Hours per day	_____
Q4032	Minutes per day	_____

Q4033	**Moderate Activity** Now think about activities which take moderate physical effort that you did in the last 7 days. Moderate physical activities make you breathe somewhat harder than normal and may include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on **how many days** did you do moderate physical activities? **(Show Physical Activity card to respondent ---- see Appendix A4.4)**	_____	If No: Go to Q4036

How much time did you usually spend doing **moderate physical activities** on one of those days?

Q4034	Hours per day	_____
Q4035	Minutes per day	_____

Q4036	**Walking** Now think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure. During the last 7 days, on **how many days** did you walk for at least 10 minutes at a time?	_____	If No: Go to Q4040

How much time did you usually spend **walking** on one of those days?

Q4037	Hours per day	_____
Q4038	Minutes per day	_____

Environmental Risk Factors / Water and Sanitation

Q4040	What type of floor does your dwelling / house have?	**1.** Hard floor (tile, cement, brick, wood)	**2.** Earth floor			
Q4041	What type of wall does your dwelling / house have?	**1.** Cement, brick, stone or wood				
		2. Mud brick				
		3. Thatch and other				
		4. Plastic sheet				
		5. Metal sheet				
		6. Other				
Q4042	What is the main source of drinking water for members of this household? **(Show card to respondent ---- see Appendix A4.5)**	**1.** Piped water through house connection or yard				If 1: Go to Q4045
		2. Public standpipe				
		3. Protected tube well or bore hole				
		4. Protected dug well or protected spring				
		5. Unprotected dug well or spring				
		6. Rainwater (into tank or cistern)				
		7. Water taken directly from pond-water or stream				
		8. Tanker-truck, vendor				
Q4043	How long does it take to get there, get water and come back?	**1.** Less than 5 minutes	**2.** Between 5 to 30 minutes	**3.** Between 30 to 60 minutes	**4.** Between 60 to 90 minutes	**5.** More than 90 minutes
Q4044	Are there at least 20 litres of water per person (about one bucket) available per day (for drinking, cooking, personal hygiene etc.) in the household?	**1.** Yes		**5.** No		

Q4045	What type of toilet facilities does your household use? **(Show card to respondent ---- see Appendix A4.6)**	**1.** Flush to piped sewage system		
		2. Flush to septic tank		
		3. Pour flush latrine		
		4. Covered dry latrine (with privacy)		
		5. Uncovered dry latrine (without privacy)		
		6. Bucket latrine (where fresh excreta are manually removed)		
		7. No facilities (open defecation)		
		8. Other		
Q4046	How far is the facility from your dwelling/house	**1.** Within property / yard, used by single household		
		2. Within property / yard, used by multiple household		
		3. Outside property / yard, private		
		4. Outside property / yard, shared		
Q4047	What type of fuel does your household mainly use for cooking?	**1.** Gas		If 1 or 2: Go to Q4050
		2. Electricity		
		3. Kerosene		
		4. Coal		
		5. Charcoal		
		6. Wood		
		7. Agriculture/crop		
		8. Animal dung		
		9. Shrubs/grass		
		10. Other		
Q4048	What type of cooking stove is used in your house? **(Show card to respondent ---- see Appendix A4.7)**	**1.** Open fire or stove without chimney or hood		
		2. Open fire or stove with chimney or hood		
		3. Closed stove with chimney		
		4. Other		
Q4049	Where is cooking usually done?	**1.** In a room used for living or sleeping		
		2. In a separate room used as kitchen		
		3. In a separate building used as kitchen		
		4. Outdoors		
Q4050	Do you heat your house when it is cold?	**1.** Yes	**5.** No	If No: Go to Q5000

Q4051	What type of fuel does your household mainly use for heating?	**1.** Gas	If 1 or 2: Go to 5000
		2. Electricity	
		3. Kerosene	
		4. Coal	
		5. Charcoal	
		6. Wood	
		7. Agriculture/crop	
		8. Animal dung	
		9. Shrubs/grass	
		10. Other	
Q4052	What type of heating stove is used in your house? **(Show card to respondent ---- see Appendix A4.7)**	**1.** Open fire or stove without chimney or hood	
		2. Open fire or stove with chimney or hood	
		3. Closed stove with chimney	
		4. Other	

Time End: __ __ : __ __

6000. Coverage

Time Begin: __ __ : __ __

***READ TO RESPONDENTS*: Now I would like to read to you questions about some health problems or health care needs that you and the young children in this house may have experienced, and the treatment or medical care that you may have received.**

CHRONIC CONDITIONS - DIAGNOSIS AND TREATMENT *(Questions to be asked to all respondents)*

Q6000	Have you ever been diagnosed with arthritis (a disease of the joints)?	1. Yes	5. No	8. DK
Q6001	Have you ever been treated for it?	1. Yes	5. No	8. DK
Q6002	Have you been taking any medications or other treatment for it during the last 2 weeks?	1. Yes	5. No	8. DK

During the last 12 months, have you experienced any of the following:

Q6003	Pain, aching, stiffness or swelling in or around the joint (like arms, hands, legs or feet) which were not related to an injury and lasted for more than a month ?	1. Yes	5. No	
Q6004	Stiffness in the joint in the morning after getting up from bed, or after a long rest of the joint without movement ?	1. Yes	5. No	If No: Go to Q6007
Q6005	How long does this stiffness last? *READ CHOICES AND MARK AS APPROPRIATE*	1. About 30 minutes or less	2. More than 30 minutes	
Q6006	Does this stiffness go away after exercise or movement in the joint?	1. Yes	5. No	

Q6007	Have you experienced back pain (including disc problems) during the last 30 days?	1. Yes	5. No	If No: Go to Q6009
Q6008	How many days did you have this back pain during the last 30 days?	Days _____		

Q6009	Have you ever been diagnosed with angina or angina pectoris (a heart disease)?	1. Yes	5. No	8. DK
Q6010	Have you ever been treated for it?	1. Yes	5. No	8. DK

Q6011	Have you been taking any medications or other treatment for it during the last 2 weeks?	1. Yes	5. No	8. DK

During the last 12 months, have you experienced any of the following:

Q6012	Pain or discomfort in your chest when you walk uphill or hurry?	1. Yes	5. No	9. Never walks uphill or hurries
Q6013	Pain or discomfort in your chest when you walk at an ordinary pace on level ground?	1. Yes	5. No	If Q6012 and Q6013 No: Go to Q6017
Q6014	What do you do if you get the pain or discomfort when you are walking? *READ CHOICES*	1. Stop or slow down 2. Carry on after taking a pain relieving medicine that dissolves in your mouth 3 . Carry on		
Q6015	If you stand still, what happens to the pain or discomfort? *READ CHOICES*	1. Relieved	2. Not relieved	
Q6016	Will you show me where you usually experience the pain or discomfort? *RECORD ALL AREAS OF BODY MENTIONED OR SHOWED*	1. Upper or middle chest	2. Lower chest	3. Left arm 4. Other

Q6017	Have you ever been diagnosed with asthma (an allergic respiratory disease)?	1. Yes	5. No	8. DK
Q6018	Have you ever been treated for it?	1. Yes	5. No	8. DK
Q6019	Have you been taking any medications or other treatment for it during the last 2 weeks?	1. Yes	5. No	8. DK

During the last 12 months, have you experienced any of the following:

Q6020	Attacks of wheezing or whistling breathing?	1. Yes	5. No
Q6021	Attack of wheezing that came on after you stopped exercising or some other physical activity?	1. Yes	5. No
Q6022	A feeling of tightness in your chest?	1. Yes	5. No
Q6023	Have you woken up with a feeling of tightness in your chest in the morning or any other time?	1. Yes	5. No
Q6024	Have you had an attack of shortness of breath that came on without obvious cause when you were not exercising or doing some physical activity?	1. Yes	5. No

Q6025	Have you ever been diagnosed with depression?	1. Yes	5. No	8. DK
Q6026	Have you ever been treated for it?	1. Yes	5. No	8. DK
Q6027	Have you been taking any medications or other treatment for it during the last 2 weeks?	1. Yes	5. No	8. DK

During the last 12 months, have you experienced any of the following:

Q6028	Have you had a period lasting several days when you felt sad, empty or depressed?	1. Yes	5. No	8. DK
Q6029	Have you had a period lasting several days when you lost interest in most things you usually enjoy such as hobbies, personal relationships or work?	1. Yes	5. No	8. DK
Q6030	Have you had a period lasting several days when you have been feeling your energy decreased or that you are tired all the time?	1. Yes	5. No	8. DK
Q6031	Was this period [of sadness/loss of interest/low energy] for more than 2 weeks?	1. Yes	5. No	
Q6032	Was this period [of sadness/loss of interest/low energy] most of the day, nearly every day?	1. Yes	5. No	
Q6033	During this period, did you lose your appetite?	1. Yes	5. No	
Q6034	During this period, did you notice any slowing down in your thinking?	1. Yes	5. No	

Q6035	Have you ever been diagnosed to have a mental health problem such as schizophrenia or psychosis?	1. Yes	5. No	8. DK
Q6036	Have you ever been treated for it?	1. Yes	5. No	8. DK
Q6037	Have you been taking any medications or other treatment for it during the last 2 weeks?	1. Yes	5. No	8. DK

During the last 12 months, have you experienced any of the following:

Q6038	A feeling something strange and unexplainable was going on that other people would find hard to believe?	1. Yes	5. No	8. DK
Q6039	A feeling that people were too interested in you or there was a plot to harm you?	1. Yes	5. No	8. DK
Q6040	A feeling that your thoughts were being directly interfered or controlled by another person, or your mind was being taken over by strange forces?	1. Yes	5. No	8. DK

Q6041	An experience of seeing visions or hearing voices that others could not see or hear when you were not half asleep, dreaming or under the influence of alcohol or drugs?	1. Yes	5. No	8. DK

Q6042	Have you ever been diagnosed with diabetes (high blood sugar)?	1. Yes	5. No	8. DK
Q6043	Have you ever been treated for it?	1. Yes	5. No	8. DK
Q6044	Have you been taking insulin or other blood sugar lowering medications in the last 2 weeks?	1. Yes	5. No	8. DK
Q6045	Are you following a special diet, exercise regime or weight control program for diabetes?	1. Yes	5. No	8. DK

TUBERCULOSIS DIAGNOSIS AND TREATMENT *(Questions to be asked to all respondents)*

During the last 12 months, have you experienced any of the following:

Q6100	Cough that lasted for 3 weeks or longer ?	1. Yes	5. No
Q6101	Have you had blood in your phlegm or have you coughed blood?	1. Yes	5. No
Q6102	In the last 12 months, have you had a tuberculosis (TB) test? I mean, has a doctor examined your sputum (taken a sample of the substance spit out from a deep cough and sent it to a laboratory for analysis) or made an x-ray of your chest?	1. Yes	5. No

INVENTORY OF MEDICINES AND DRUGS *(Questions to be asked to all respondents)*

We are interested in knowing about the availability and use of certain medicines and drugs. Remember that whatever information you give me is confidential and will only be used for research purposes.

Q6200	Do you keep any medicines or drugs in the house?	1. Yes		5. No	If No: Go to Q6300
Q6201	May I see what medicines you personally have been using in the last 2 weeks?	1. Yes	5. No, not using any	7. Refuse	If No or Refuse: Go to Q6300

STUDY ON GLOBAL AGEING AND ADULT HEALTH
Wave 1

Individual Questionnaire – Set A

Table of Contents

Section 1000: Socio-Demographic Characteristics

Time Begin ☐☐:☐☐

Q1006	*Household ID*	☐☐☐☐☐	
Q1007	*Person (HH member) number from HH roster (number from column)*	☐☐	
Q1008	What is your mother tongue? By mother tongue, we mean the language you learned first, the language that you can express yourself fully in, or voluntarily identify with.	1 Country-specific 1 2 Country-specific 2 3 Country-specific 3 4 … 87 Other, specify:	
Q1009	*INTERVIEWER:* *Record sex of the respondent*	1 MALE 2 FEMALE	
Q1010	What day, month and year were you born? *DD / MM / YYYY* *Check birth certificate if available.*	☐☐/☐☐/☐☐☐☐ -8 *DON'T KNOW*	
Q1011	How old are you now? *INTERVIEWER: This would be age at last birthday. If don't know - probe.*	☐☐☐ AGE IN YEARS	
Q1012	What is your <u>current</u> marital status?	1 NEVER MARRIED ……➔ 2 CURRENTLY MARRIED ……➔ 3 COHABITING ……➔ 4 SEPARATED/DIVORCED ……➔ 5 WIDOWED ……➔	Q1015 Q1014 Q1014 Q1013 Q1013
Q1013	For how many <u>years</u> have you been separated, divorced or widowed? *INTERVIEWER: if less than 1 year, enter "00"*	☐☐ NUMBER OF YEARS ……➔ -8 *DON'T KNOW* ……➔	Q1015 Q1015
Q1014	For how many <u>years</u> have you been married or living together? *INTERVIEWER: if less than 1 year, enter "00"*	☐☐ NUMBER OF YEARS -8 *DON'T KNOW*	
Q1015	Have you <u>ever</u> been to school?	1 YES 2 NO ……➔	Q1018

Q1016	What is the highest level of education that you have completed?	1 LESS THAN PRIMARY SCHOOL 2 PRIMARY SCHOOL COMPLETED 3 SECONDARY SCHOOL COMPLETED 4 HIGH SCHOOL(OR EQUIVALENT) COMPLETED 5 COLLEGE/PRE-UNIVERSITY/UNIVERSITY COMPLETED 6 POST GRADUATE DEGREE COMPLETED	
Q1017	How many years of school, including higher education have you completed?	☐☐ NUMBER OF YEARS -8 *DON'T KNOW*	
Q1018	What is your background or ethnic group?	1 COUNTRY-SPECIFIC 1 2 COUNTRY-SPECIFIC 2 3 COUNTRY-SPECIFIC 3 4 …. 7 OTHER, SPECIFY:	
Q1019	Do you belong to a religious denomination? *INTERVIEWER: allow the respondent to reply without reading categories. Clarify as needed.* *Only one option allowed.*	1 NO, NONE 2 BUDDHISM 3 CHINESE TRADITIONAL RELIGION 4 CHRISTIANITY (INCLUDING ROMAN CATHOLIC, PROTESTANT, ORTHODOX, OTHER) 5 HINDUISM 6 ISLAM 7 JAINISM 8 JUDAISM 9 PRIMAL INDIGENOUS (INCLUDING AFRICAN TRADITIONAL AND DIASPORIC) 10 SIKHISM 87 *OTHER , SPECIFY:* 97 REFUSED	
Q1020	Have you always lived in this village/town/city?	1 YES ……..➔ 2 NO	Q1025
Q1021	How long have you been living (continuously) in this area? *INTERVIEWER: IF LESS THAN 1 YEAR, ENTER "00".*	☐☐ YEARS -8 *DON'T KNOW*	

Q1022	Where were you living before?	1	In same community/locality/neighborhood
		2	In another city in this region
		3	In another rural area in this region
		4	In another city outside this region but in country
		5	In another rural area outside this region but in country
		6	Outside the country
Q1023	Where have you lived for most of your adult life (18+ years)?	1	IN SAME COMMUNITY/LOCALITY/NEIGHBORHOOD
		2	IN ANOTHER CITY IN THIS REGION
		3	IN ANOTHER RURAL AREA IN THIS REGION
		4	IN ANOTHER CITY OUTSIDE THIS REGION IN COUNTRY
		5	IN ANOTHER RURAL AREA OUTSIDE THIS REGION BUT IN COUNTRY
		6	OUTSIDE THE COUNTRY
Q1024	Where did you live for most of your childhood (age 9 or younger)?	1	IN SAME COMMUNITY/LOCALITY/NEIGHBORHOOD
		2	IN ANOTHER CITY IN THIS REGION
		3	IN ANOTHER RURAL AREA IN THIS REGION
		4	IN ANOTHER CITY OUTSIDE THIS REGION BUT IN COUNTRY
		5	IN ANOTHER RURAL AREA OUTSIDE THIS REGION BUT IN COUNTRY
		6	OUTSIDE THE COUNTRY

Before we move onto the next section, I would like to ask you a few questions about your [*biological*] parents. I would like to know about their level of education and main occupation.

Let's start with your mother.

Q1025	Was your mother ever employed?	1	YES	
		2	NO ……..➔	Q1028
Q1026	Who is/was your mother's main employer over her working life?	1	Public sector (Government)	
		2	Private sector (For profit or not for profit)	
		3	Self-employed	
		4	Informal employment	
Q1027	What is/was her main occupation? *INTERVIEWER: write exactly what the respondent says - clarify if you do not understand - write clearly in capital letters*	_____		

Q1028	What is the highest level of education that she completed?	0 NO FORMAL EDUCATION 1 LESS THAN PRIMARY SCHOOL 2 PRIMARY SCHOOL COMPLETED 3 SECONDARY SCHOOL COMPLETED 4 HIGH SCHOOL(OR EQUIVALENT) COMPLETED 5 COLLEGE/PRE-UNIVERSITY/UNIVERSITY COMPLETED 6 POST GRADUATE DEGREE COMPLETED 8 *DON'T KNOW*	

Now if you would please tell me about your father.

Q1029	Was your father ever employed?	1 YES 2 NO ……..➔	Q1032
Q1030	Who is/was your father's main employer over his working life?	1 Public sector (Government) 2 Private sector (For profit or Not for profit) 3 Self-employed 4 Informal employment	
Q1031	What is/was his main occupation? *INTERVIEWER: write exactly what the respondent says - clarify if you do not understand - write clearly in capital letters*	_____ ☐☐☐☐	
Q1032	What is the highest level of education that he completed?	0 NO FORMAL EDUCATION 1 LESS THAN PRIMARY SCHOOL 2 PRIMARY SCHOOL COMPLETED 3 SECONDARY SCHOOL COMPLETED 4 HIGH SCHOOL(OR EQUIVALENT) COMPLETED 5 COLLEGE/PRE-UNIVERSITY/UNIVERSITY COMPLETED 6 POST GRADUATE DEGREE COMPLETED 8 *DON'T KNOW*	

Thank you, that ends this section – we will return to questions about you in the next section.

Time End ☐☐:☐☐

Section 1500: Work History and Benefits

Time Begin ☐☐:☐☐

Now I would like to ask you some questions about any work you may be doing now or have done in the past. I will ask some questions about the type and amount of your current or past work, benefits, if any, you may be receiving or have received from your work, and the reasons for why you may not be working currently.

Q1501	As you know, some people take jobs for which they are paid in cash or kind. Other people sell things, have a small business, or work on the family farm or family business. Have you ever in your life done any of these things or any type of work (not including housework)?	1 YES ……..➔ 2 NO	Q1502
	Q1501a. What is the main reason that you have never worked?	1 HOMEMAKER / CARING FOR FAMILY 2 COULD NOT FIND A JOB 3 DO VOLUNTARY WORK 4 IN STUDIES / TRAINING 5 HEALTH PROBLEMS/DISABLED 6 HAVE TO TAKE CARE OF FAMILY MEMBER 7 DO NOT HAVE THE ECONOMIC NEED 8 PARENTS / SPOUSE DID NOT LET ME 87 OTHER, SPECIFY:	Q2000
Q1502	At what age did you start working for pay?	☐☐ YEARS OF AGE .....➔ -8 *DON'T KNOW*	Q1503
	Q1502a. How many years ago did you start working?	☐☐ YEARS AGO	
Q1503	Have you worked for at least 2 days during the last 7 days?	1 YES..... ➔ 2 NO	Q1508
Q1504	What is the main reason you are not currently working? *INTERVIEWER:* *Only one answer allowed*	1 HOMEMAKER / CARING FOR FAMILY 2 CANNOT FIND A JOB 3 DO VOLUNTARY WORK (NOT PAID OR SUBSISTENCE WORK) 4 IN STUDIES / TRAINING 5 HEALTH PROBLEMS/DISABLED 6 HAVE TO TAKE CARE OF FAMILY MEMBER 7 DO NOT HAVE THE ECONOMIC NEED 8 MY FAMILY/SPOUSE DOESN'T WANT ME TO WORK 9 RETIRED / TOO OLD TO WORK 10 LAID OFF / MADE REDUNDANT 11 SEASONAL WORK .....➔ 12 VACATION / SICK LEAVE / VOLUNTARY AND TEMPORARY TIME OFF .....➔ 87 OTHER, SPECIFY:	Q1508 Q1508
Q1505	At what age did you stop working for pay?	☐☐ YEARS OF AGE ……➔ 8 *DON'T KNOW*	Q1506

	Q1505a. *(only if Q1505 is Don't Know)* How many years ago did you stop working?	☐☐ YEARS AGO	
Q1506	Are you actively looking for work at this time?	1 YES 2 NO .....→	Q1508
Q1507	What is the main reason that you would you like to work at present? *INTERVIEWER: Only one answer allowed - read categories if needed.*	1 NEED THE INCOME 2 WANT TO/NEED TO BE ACTIVE 3 WANT TO FEEL USEFUL 4 HELP MY FAMILY 7 OTHER, SPECIFY:	
Now I will ask you some questions about your current work or your most recent work. Please answer these questions thinking about your current work, or if you are not working currently, think about your most recent work.			
Q1508	Are/were you paid in cash or kind for your work or are/were you not paid at all?	1 CASH ONLY 2 IN KIND ONLY 3 CASH AND KIND 4 NOT PAID	
Q1509	Who is/was your employer in your current/most recent MAIN job?	1 PUBLIC SECTOR (GOVERNMENT) 2 PRIVATE SECTOR (FOR PROFIT AND NOT FOR PROFIT) 3 SELF-EMPLOYED 4 INFORMAL EMPLOYMENT	
Q1510	In the last 12 months, for your main job, what has been your main occupation? *INTERVIEWER: Write exactly what the respondent says - write clearly in capital letters.*	_____ ☐☐☐☐	
Q1511	Do/did you usually work throughout the year, or do/did you work seasonally, or only once in a while for your main job?	1 WORK THROUGHOUT THE YEAR 2 SEASONALLY/PART OF THE YEAR 3 ONCE IN A WHILE	
Q1512	On average, how many days a week do/did you work in your main job?	☐ DAYS	
Q1513	On average, how many hours a day do/did you work in your main job?	☐☐ HOURS	
Q1514	In this main job, do/did you receive any of the following benefits in addition to your payment in cash or in kind?	a. Retirement or pension — 1 YES 2 NO	
		b. Medical services/health care — 1 YES 2 NO	
		c. Food or provisions — 1 YES 2 NO	
		d. Cash bonuses — 1 YES 2 NO	
		e. No benefits — 1 YES 2 NO	
		f. *Other, specify:* — 1 YES 2 NO	
Q1515	Have you worked at more than one job over the last 12 months?	1 YES 2 NO	

Time End ☐☐:☐☐

Section 2000: Health State Descriptions

Time Begin ☐☐:☐☐

Now we will switch to questions specifically about your health. The first questions are about your overall health, including both your physical and your mental health. By difficulty in the second question, I mean requiring increased effort, discomfort or pain, slowness or changes in the way you do the activity.

Q2000	In general, how would you rate your health today?	1	Very good
		2	Good
		3	Moderate
		4	Bad
		5	Very bad
Q2001	Overall in the last 30 days, how much difficulty did you have with work or household activities?	1	None
		2	Mild
		3	Moderate
		4	Severe
		5	Extreme/cannot do

Now I would like to review the different functions of your body. When answering these questions, I would like you to think about the last 30 days, taking both good and bad days into account. When I ask about difficulty, I would like you to consider how much difficulty you have had, on average, in the last 30 days, while doing the activity in the way that you usually do it. Let me remind you, by difficulty I mean requiring increased effort, discomfort or pain, slowness or changes in the way you do the activity.

INTERVIEWER: Read and show scale to respondent.

MOBILITY

	Overall in the last 30 days, how much difficulty did you have …	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2002	… with moving around?	1	2	3	4	5
Q2003	… in vigorous activities ('vigorous activities' require hard physical effort and cause large increases in breathing or heart rate)?	1	2	3	4	5

INTERVIEWER: Use Showcard if needed for mobility.

SELF-CARE

	Overall in the last 30 days, how much difficulty did you have …	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2004	… with self-care, such as bathing/washing or dressing yourself?	1	2	3	4	5
Q2005	… in taking care of and maintaining your general appearance (for example, grooming, looking neat and tidy)?	1	2	3	4	5
Q2006	… in staying by yourself for a few days (3 to 7 days)?	1	2	3	4	5

PAIN AND DISCOMFORT

	Overall in the last 30 days,…	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2007	…how much of bodily aches or pains did you have?	1	2	3	4	5
Q2008	…how much bodily discomfort did you have?	1	2	3	4	5
	If Q2007 and Q2008 are both = 1, "None"……➔					Q2010
Q2009	… how much difficulty did you have in your daily life because of your pain?	1	2	3	4	5

COGNITION

	Overall in the last 30 days, how much difficulty…	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2010	… did you have with concentrating or remembering things?	1	2	3	4	5
Q2011	… did you have in learning a new task (for example, learning how to get to a new place, learning a new game, learning a new recipe)?	1	2	3	4	5

INTERPERSONAL ACTIVITIES

	Overall in the last 30 days, how much difficulty did you have,…	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2012	… with personal relationships or participation in the community?	1	2	3	4	5
Q2013	… in dealing with conflicts and tensions with others?	1	2	3	4	5
Q2014	… with making new friendships or maintaining current friendships?	1	2	3	4	5
Q2015	…with dealing with strangers?	1	2	3	4	5

SLEEP AND ENERGY

	Overall in the last 30 days, how much of a problem did you…	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2016	… have with sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?	1	2	3	4	5
Q2017	… have due to not feeling rested and refreshed during the day (for example, feeling tired, not having energy)?	1	2	3	4	5

AFFECT

	Overall in the last 30 days, how much of a problem did you have…	NONE	MILD	MODERATE	SEVERE	EXTREME / CANNOT DO
Q2018	…with feeling sad, low or depressed?	1	2	3	4	5
Q2019	… with worry or anxiety?	1	2	3	4	5

VISION (*Respondent should answer, as when wearing glasses/contact lenses if used*)

Q2020	When was the last time you had your eyes examined by a medical professional? *INTERVIEWER: ENTER YEARS AGO. ENTER "00" IF LESS THAN 1 YEAR.*	☐☐ YEARS AGO -8 *DON'T KNOW* 98 NEVER
Q2021	Do you use eyeglasses or contact lenses to see far away (for example, across the street)?	1 YES 2 NO
Q2022	Do you use eyeglasses or contact lenses to see up close (for example at arms length, like when you are reading)?	1 YES 2 NO
Q2023	In the last 30 days, how much difficulty did you have in seeing and recognising an object or a person you know across the road (from a distance of about 20 meters)?	1 NONE 2 MILD 3 MODERATE 4 SEVERE 5 EXTREME / CANNOT DO
Q2024	In the last 30 days, how much difficulty did you have in seeing and recognising an object at arm's length (for example, reading)?	1 NONE 2 MILD 3 MODERATE 4 SEVERE 5 EXTREME / CANNOT DO

FUNCTIONING ASSESSMENT

These next questions ask about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs.

Think back over the last 30 days and answer these questions thinking about how much difficulty you had doing the following activities. Some of these questions may seem repetitive, but we do need your attention and it is important to give us answers to each question.

INTERVIEWER: *For each question, please circle only one response. 'N/A' means 'not applicable'.*

	In the last 30 days, how much difficulty did you have …	None	Mild	Moderate	Severe	Extreme/ cannot do	N/A
Q2025	… in sitting for long periods?	1	2	3	4	5	9
Q2026	… in walking 100 meters?	1	2	3	4	5	9
Q2027	… in standing up from sitting down?	1	2	3	4	5	9
Q2028	… in standing for long periods?	1	2	3	4	5	9
Q2029	… with climbing one flight of stairs without resting?	1	2	3	4	5	9
Q2030	… with stooping, kneeling or crouching?	1	2	3	4	5	9
Q2031	… picking up things with your fingers (such as picking up a coin from a table)?	1	2	3	4	5	9
Q2032	… in taking care of your household responsibilities?	1	2	3	4	5	9

	In the last 30 days, how much difficulty did you have …	NONE	MILD	MODERATE	SEVERE	EXTREME/ CANNOT DO	N/A
Q2033	… in joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	1	2	3	4	5	9
Q2034	… in extending your arms above shoulder level?	1	2	3	4	5	9
Q2035	… concentrating on doing something for 10 minutes?	1	2	3	4	5	9
Q2036	… in walking a long distance such as a kilometer?	1	2	3	4	5	9
Q2037	… in bathing/washing your whole body?	1	2	3	4	5	9
Q2038	… in getting dressed?	1	2	3	4	5	9
Q2039	… in your day to day work?	1	2	3	4	5	9
Q2040	… with carrying things?	1	2	3	4	5	9
Q2041	… with moving around inside your home (such as walking across a room)?	1	2	3	4	5	9
Q2042	… with eating (including cutting up your food)?	1	2	3	4	5	9
Q2043	… with getting up from lying down?	1	2	3	4	5	9
Q2044	… with getting to and using the toilet?	1	2	3	4	5	9
Q2045	… with getting where you want to go, using private or public transport if needed?	1	2	3	4	5	9
Q2046	… getting out of your home?	1	2	3	4	5	9
Q2047	In the last 30 days, how much have you been emotionally affected by your health condition(s)?	1	2	3	4	5	9
Q2048	Overall, how much did these difficulties interfere with your life?	1	2	3	4	5	9

Q2049	Besides any vision aids (eyeglasses or contact lenses) do you use any other assistive devices (cane, walker or other) for any difficulties you experience?	1 YES 2 NO

Section 3000: Risk Factors and Preventive Health Behaviours

Time Begin ☐☐:☐☐

We would now like to ask you some questions about your habits, health behaviours and awareness about health. This includes things like smoking, drinking alcohol, eating enough fruits and vegetables as part of your diet and your levels of physical activity. I will start with questions about smoking habits.

TOBACCO AND OTHER SMOKING *(SEE APPENDIX A3000A)*

Q3001	Have you ever smoked tobacco or used smokeless tobacco?	1 YES 2 NO ……→	Q3007
Q3002	Do you currently use (smoke, sniff or chew) any tobacco products such as cigarettes, cigars, pipes, chewing tobacco or snuff?	1 YES, DAILY 2 YES, BUT NOT DAILY ……→ 3 NO, NOT AT ALL ……→	 Q3005 Q3005
Q3003	For how long have you been smoking or using tobacco daily? *INTERVIEWER: If less than one month – enter "00" for years and "00" for months.*	☐☐ YEARS ☐☐ MONTHS *-8 DON'T KNOW*	
Q3004	On average, how many of the following products do you smoke or use each day?	*Include number below:*	
	Q3004a. Manufactured cigarettes	☐☐	
	Q3004b. Hand-rolled cigarettes	☐☐	
	Q3004c. Pipefuls of tobacco	☐☐	
	Q3004d. Cigars, cheroots, cigarillos, bidis	☐☐	
	Q3004e. Smokeless tobacco	☐☐☐ GRAMS/DAY	
	Q3004f. Other, specify:	☐☐ ……→	Q3007
Q3005	In the past, did you ever smoke tobacco or use smokeless tobacco daily?	1 Yes 2 No ……→	Q3007
Q3006	How old were you when you stopped smoking or using tobacco daily?	☐☐ YEARS OF AGE ……→ -8 *DON'T KNOW* ……→	Q3007 Q3006a

	Q3006a. How long ago did you stop smoking or using tobacco daily? *INTERVIEWER: If less than one month – enter "00" for months.*	☐☐ YEARS AGO ☐☐ MONTHS AGO -8 *DON'T KNOW*

ALCOHOL *(show Alcohol card to respondent - see Appendix A3000B)*

Q3007	Have you ever consumed a drink that contains alcohol (such as beer, wine, spirits, etc.)?	1 YES 2 NO, NEVER ……..……..➔	Q3012
Q3008	Have you consumed alcohol in the last 30 days?	1 YES 2 NO ……..……..➔	Q3010
Q3009	During the past 7 days, how many drinks of any alcoholic beverage did you have each day? *USE SHOWCARD Appendix A3000B.*	*INTERVIEWER: Want respondent to tell you the number of "standard" drinks. By standard drink - refer to Appendix. Include number below:*	
	Q3009a. Monday	☐☐	
	Q3009b. Tuesday	☐☐	
	Q3009c. Wednesday	☐☐	
	Q3009d. Thursday	☐☐	
	Q3009e. Friday	☐☐	
	Q3009f. Saturday	☐☐	
	Q3009g. Sunday	☐☐	
Q3010	In the last 12 months, how frequently [on how many days] on average have you had at least one alcoholic drink?	0 NO DAYS ……..……..➔ 1 LESS THAN ONCE A MONTH 2 ONE TO THREE DAYS PER MONTH 3 ONE TO FOUR DAYS PER WEEK 4 FIVE OR MORE DAYS PER WEEK	Q3012
Q3011	In the last 12 months, on the days you drank alcoholic beverages, how many drinks did you have on average?	☐☐ DRINKS -8 *DON'T KNOW*	

NUTRITION

Studies have shown that nutrition and life-style are very important health factors. I want to ask you a few questions about your diet. I am going to ask you about the fruit and vegetables you usually eat.
(Show Nutrition card to respondent -- see Appendix A3000C)

Q3012	How many servings of fruit* do you eat on a typical day? * Banana, mango, apple, orange, papaya, tangerine, grapefruit, peach, pear (country-specific)	☐☐ SERVINGS -8 *DON'T KNOW*
Q3013	How many servings of vegetables* do you eat on a typical day? * Tomato, cauliflower, potato, cucumber, peas, corn lettuce, squash, bean (country-specific)	☐☐ SERVINGS -8 *DON'T KNOW*
Q3014	In the last 12 months, how often did you ever eat less than you felt you should because there wasn't enough food?	1 Every month 2 Almost every month 3 Some months, but not every month 4 Only in 1 or 2 months 5 Never
Q3015	In the last 12 months, were you ever hungry, but didn't eat because you couldn't afford enough food?	1 Every month 2 Almost every month 3 Some months, but not every month 4 Only in 1 or 2 months 5 Never

PHYSICAL ACTIVITY - *(SEE APPENDIX A3000D)*

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be an active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, household chores, harvesting food/crops, fishing or hunting for food, providing care or seeking employment.

In answering the following questions 'vigorous activities' require hard physical effort and cause large increases in breathing or heart rate, 'moderate activities' require moderate physical effort and cause small increases in breathing or heart rate.

Q3016	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate, [like heavy lifting, digging or chopping wood] for at least 10 minutes continuously? *INSERT EXAMPLES & USE SHOWCARD*	1 YES 2 NO ……➔	Q3019
Q3017	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	☐ DAYS	
Q3018	How much time do you spend doing vigorous-intensity activities at work on a typical day?	☐☐:☐☐ *HOURS:MINUTES*	
Q3019	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate [such as brisk walking, carrying light loads, cleaning, cooking, or washing clothes] for at least 10 minutes continuously? *INSERT EXAMPLES & USE SHOWCARD*	1 YES 2 NO ……➔	Q3022
Q3020	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	☐ DAYS	
Q3021	How much time do you spend doing moderate-intensity activities at work on a typical day?	☐☐:☐☐ *HOURS:MINUTES*	

The next questions exclude the physical activities at work that you've already mentioned.
Now I would like to ask you about the usual way you travel to and from places. For example, getting to work, to shopping, to the market, to place of worship. [Insert other examples if needed]

Q3022	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1 YES 2 NO ……..➔	Q3025
Q3023	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	☐ DAYS	
Q3024	How much time would you spend walking or bicycling for travel on a typical day?	☐☐:☐☐ *HOURS:MINUTES*	

The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness, leisure and recreational activities [*insert relevant terms*].

Q3025	Do you do any <u>vigorous intensity sports, fitness or recreational (leisure) activities</u> that cause large increases in breathing or heart rate [like running or football], for at least 10 minutes continuously? *INSERT EXAMPLES & USE SHOWCARD*	1 YES 2 NO ……➔	Q3028
Q3026	In a typical week, on how many days do you do <u>vigorous</u> intensity sports, fitness or recreational (leisure) activities?	☐ DAYS	
Q3027	How much time do you spend doing <u>vigorous</u> intensity sports, fitness or recreational activities on a typical day?	☐☐:☐☐ *HOURS:MINUTES*	
Q3028	Do you do any <u>moderate-intensity sports, fitness or recreational (leisure) activities</u> that causes a small increase in breathing or heart rate [*such as brisk walking, cycling or swimming*] for at least 10 minutes at a time? *INSERT EXAMPLES & USE SHOWCARD*	1 YES 2 NO ……..➔	Q3031
Q3029	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	☐ DAYS	
Q3030	How much time do you spend doing moderate intensity sports, fitness or recreational (leisure) activities on a typical day?	☐☐:☐☐ *HOURS:MINUTES*	

The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent [*sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television*], but do not include time spent sleeping.

INSERT EXAMPLES & USE SHOWCARD

Q3031	How much time do you usually spend sitting or reclining on a typical day?	☐☐:☐☐ *HOURS:MINUTES*

Time End ☐☐:☐☐

Section 4000: Chronic Conditions and Health Services Coverage

Time Begin ☐☐:☐☐

Now I would like to read you questions about some health problems or health care needs that you may have experienced, and the treatment or medical care that you may have received.

ARTHRITIS

Q4001	Have you ever been diagnosed with/told you have <u>arthritis</u> (a disease of the joints, or by other names rheumatism or osteoarthritis)?	1 YES 2 NO ……..……➔	Q4003
Q4002	Have you been taking medications or other treatment for it…..		
	Q4002a. …during the last 2 weeks?	1 YES 2 NO	
	Q4002b …during the last 12 months?	1 YES 2 NO	
Q4003	During the <u>last 12 months</u>, have you experienced, pain, aching, stiffness or swelling in or around the joints (like arms, hands, legs or feet) which were not related to an injury and lasted for more than a month?	1 YES 2 NO	
Q4004	During the <u>last 12 months</u>, have you experienced stiffness in the joint in the <u>morning after getting up</u> from bed, or <u>after a long rest</u> of the joint without movement?	1 YES 2 NO……..……➔	Q4007
If Q4003 and Q4004 are both "No" (that is, no symptoms of arthritis), skip to ……➔			Q4008
Q4005	How long did this stiffness last?	1 About 30 minutes or less 2 More than 30 Minutes	
Q4006	Did this stiffness go away after exercise or movement in the joint?	1 YES 2 NO	
Q4007	These symptoms that you have said you experienced in the last 12 months, have you experienced them in the <u>last 2 weeks</u>?	1 YES 2 NO	
Q4008	Have you experienced <u>back pain</u> during <u>the last 30 days</u>?	1 YES 2 NO ……➔	Q4010
Q4009	On how many days did you have this back pain <u>during the last 30 days</u>?	☐☐ DAYS	

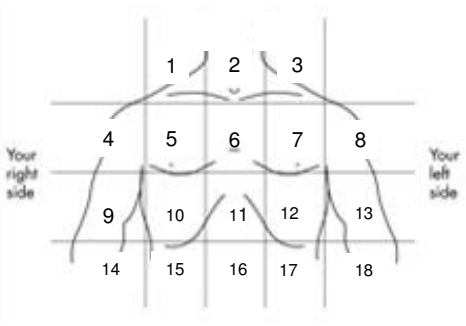
STROKE

Q4010	Have you ever been told by a health professional that you have had a stroke?	1 YES 2 NO ……➔	Q4012
Q4011	Have you been taking any medications or other treatment for it…		
	Q4011a. …during the last 2 weeks?	1 YES 2 NO	
	Q4011b. …during the last 12 months?	1 YES 2 NO	
Q4012	Have you ever suffered from sudden onset of paralysis or weakness in your arms or legs on one side of your body for more than 24 hours?	1 YES 2 NO	
Q4013	Have you ever had, for more than 24 hours, sudden onset of loss of feeling on one side of your body, without anything having happened to you immediately before?	1 YES 2 No	

ANGINA

Q4014	Have you ever been diagnosed with angina or angina pectoris (a heart disease)?	1 YES 2 NO ……➔	Q4016
Q4015	Have you been taking any medications or other treatment for it…		
	Q4015a...during the last 2 weeks?	1 YES 2 NO	
	Q4015b...during the last 12 months?	1 YES 2 NO	
Q4016	During the last 12 months, have you experienced any pain or discomfort in your chest when you walk uphill or hurry?	1 YES 2 NO 3 NEVER WALKS UPHILL OR HURRIES	
Q4017	During the last 12 months, have you experienced any pain or discomfort in your chest when you walk at an ordinary pace on level ground?	1 YES 2 NO ……➔	Q4022
Q4018	What do you do if you get the pain or discomfort when you are walking? *Read choices*	1 Stop or slow down 2 Carry on after taking a pain relieving medicine that dissolves in your mouth 3 Carry on walking	
Q4019	If you stand still, what happens to the pain or discomfort? *Read choices*	1 Relieved 2 Not relieved	

***ANGINA** continued…*

Q4020	Will you show me where you usually experience the pain or discomfort? *Circle number in each of the boxes in the areas of body mentioned or shown by the respondent.*		
Q4021	These symptoms that you have said you experienced in the last 12 months, have you experienced them in the last 2 weeks?	1 YES 2 NO	

DIABETES

Q4022	Have you ever been diagnosed with diabetes (high blood sugar)? *(Not including diabetes associated with a pregnancy)*	1 YES 2 NO ……➔	Q4025
Q4023	Have you been taking insulin or other blood sugar lowering medications…		
	Q4023a …in the last 2 weeks?	1 YES 2 NO	
	Q4023b …in the last 12 months?	1 YES 2 NO	
Q4024	Have you been following a special diet, exercise regime or weight control program for diabetes during the last 2 weeks? *(As recommended by health professional)*	1 YES 2 NO	

CHRONIC LUNG DISEASE

Q4025	Have you ever been diagnosed with chronic lung disease (emphysema, bronchitis, COPD)?	1 YES 2 NO ……➔	Q4027
Q4026	Have you been taking any medications or other treatment (like oxygen) for it …		
	Q4026a …in the last 2 weeks?	1 YES 2 NO	
	Q4026b …in the last 12 months?	1 YES 2 NO	
Q4027	During the last 12 months, have you experienced any shortness of breath at rest? *(while awake)*	1 YES 2 NO	
Q4028	During the last 12 months, have you experienced any coughing or wheezing for ten minutes or more at a time?	1 YES 2 NO	
Q4029	During the last 12 months, have you experienced any coughing up sputum or phlegm for most days of the month for at least 3 months?	1 YES 2 NO	

***CHRONIC LUNG DISEASE**, continued…*

*INTERVIEWER: IF **Q4027, Q4028 AND Q4029** ARE "NO" … → SKIP TO Q4031*			
Q4030	These symptoms that you said you experienced in the last 12 months, have you experienced them in the last 2 weeks?	1 YES 2 NO	
Q4031	In the last 12 months, have you had a tuberculosis (TB) test? I mean, has a doctor examined your sputum (taken a sample of the substance spit out from a deep cough and sent it to a laboratory for analysis) or made an x-ray of your chest?	1 YES 2 NO …… →	Q4032C
Q4032	**Q4032a.** Have you been taking any medications or other treatment for it during the last 2 weeks?	1 YES 2 NO	
	Q4032b. Have you been taking any medications or other treatment for it during the last 12 months?	1 YES 2 NO	
	INTERVIEWER: if Q4029 is "No", skip to …… …… →		Q4033
	Q4032c. Have you had blood in your phlegm or have you coughed blood?	1 YES 2 NO	

ASTHMA

Q4033	Have you ever been diagnosed with asthma (an allergic respiratory disease)?	1 YES 2 NO …… →	Q4035
Q4034	Have you been taking any medications or other treatment for it …		
	Q4034a …in the last 2 weeks?	1 YES 2 NO	
	Q4034b …in the last 12 months?	1 YES 2 NO	
During the last 12 months, have you experienced any of the following:			
Q4035	Attacks of wheezing or whistling breathing?	1 YES 2 NO	
Q4036	Attack of wheezing that came on after you stopped exercising or some other physical activity?	1 YES 2 NO	
Q4037	A feeling of tightness in your chest?	1 YES 2 NO	
Q4038	Have you woken up with a feeling of tightness in your chest in the morning or any other time?	1 YES 2 NO	
Q4039	Have you had an attack of shortness of breath that came on without obvious cause when you were not exercising or doing some physical activity?	1 YES 2 NO	
IF Q4035 TO Q4039 ARE ALL 'NO', SKIP TO …… → *IF ONE OF THE SYMPTOM QUESTIONS (Q4035 TO Q4039) IS 'YES', CONTINUE WITH Q4039a.*			Q4040
Q4039a	These symptoms that you said you experienced in the last 12 months, have you experienced them in the last 2 weeks?	1 YES 2 NO	

DEPRESSION

Q4040	Have you ever been diagnosed with depression?	1 YES 2 NO …… →	Q4042

***DEPRESSION** continued…*

Q4041	Have you been taking any medications or other treatment for it … *(Other treatment can include attending therapy or counseling sessions.)*		
	Q4041a …during the last 2 weeks?	1 YES 2 NO	
	Q4041b …during the last 12 months?	1 YES 2 NO	
Q4042	During the last 12 months, have you had a period lasting several days when you felt sad, empty or depressed?	1 YES 2 NO	
Q4043	During the last 12 months, have you had a period lasting several days when you lost interest in most things you usually enjoy such as personal relationships, work or hobbies/recreation?	1 YES 2 NO	
Q4044	During the last 12 months, have you had a period lasting several days when you have been feeling your energy decreased or that you are tired all the time?	1 YES 2 NO	
INTERVIEWER: IF ANY ONE OF Q4042, Q4043 OR Q4044 IS "YES", CONTINUE TO Q4045 *IF ALL 3 (Q4042, Q4043 AND Q4044) ARE "NO", SKIP TO* ……→ Q4060			
Q4045	Was this period [of sadness/loss of interest/low energy] for more than 2 weeks?	1 YES 2 NO ……→	Q4060
Q4046	Was this period [of sadness/loss of interest/low energy] most of the day, nearly every day?	1 YES 2 NO	
Q4047	During this period, did you lose your appetite?	1 YES 2 NO	
Q4048	Did you notice any slowing down in your thinking?	1 YES 2 NO	
Q4049	Did you notice any problems falling asleep?	1 YES 2 NO	
Q4050	Did you notice any problems waking up too early?	1 YES 2 NO	
Q4051	During this period, did you have any difficulties concentrating; for example, listening to others, working, watching TV, listening to the radio?	1 YES 2 NO	
Q4052	Did you notice any slowing down in your moving around?	1 YES 2 NO	
Q4053	During this period, did you feel anxious and worried most days?	1 YES 2 NO	
Q4054	During this period, were you so restless or jittery nearly every day that you paced up and down and couldn't sit still?	1 YES 2 NO	
Q4055	During this period, did you feel negative about yourself or like you had lost confidence?	1 YES 2 NO	
Q4056	Did you frequently feel hopeless - that there was no way to improve things?	1 YES 2 NO	
Q4057	During this period, did your interest in sex decrease?	1 YES 2 NO	
Q4058	Did you think of death, or wish you were dead?	1 YES 2 NO	
Q4059	During this period, did you ever try to end your life?	1 YES 2 NO	

Section 6000: Social Cohesion

Time Begin ☐☐:☐☐

We would like to shift away from questions about your direct health. This section of the survey asks your opinions about other areas and issues in your life. The following questions are to get your opinions about community, social and political aspects in your life.

We'd like to know about some of your involvement in your community. For all of these, I want you just to give me your best guess.

	How often in the last 12 months have you …	NEVER	ONCE OR TWICE PER YEAR	ONCE OR TWICE PER MONTH	ONCE OR TWICE PER WEEK	DAILY
Q6001	… attended any public meeting in which there was discussion of local or school affairs?	1	2	3	4	5
Q6002	… met personally with someone you consider to be a community leader?	1	2	3	4	5
Q6003	…attended any group, club, society, union or organizational meeting?	1	2	3	4	5
Q6004	… worked with other people in your neighborhood to fix or improve something?	1	2	3	4	5
Q6005	… had friends over to your home?	1	2	3	4	5
Q6006	… been in the home of someone who lives in a different neighbourhood than you do or had them in your home?	1	2	3	4	5
Q6007	… socialized with coworkers outside of work?	1	2	3	4	5
Q6008	… attended religious services (not including weddings and funerals)?	1	2	3	4	5
Q6009	… gotten out of the house/your dwelling to attend social meetings, activities, programs or events or to visit friends or relatives?	1	2	3	4	5

Q6010	Would you like to go out more often or are you satisfied with how much you get out of the house?	1 Would like to go out more often 2 Satisfied with frequency of going out ….➔ 3 Would NOT like to go out more often …➔	 Q6012 Q6012
Q6011	What is the main reason that you don't get out more?	1 Health problems 2 Safety or security concerns 3 Other non-health related reasons 7 *Other, specify:*	

We'd like to ask you a few questions about how you view other people and institutions.

Q6012	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	1 CAN BE TRUSTED 2 CAN'T BE TOO CAREFUL
Q6013	Do you have someone you can trust and confide in?	1 YES 2 NO

Next, we'd like to know how much you trust different groups of people.

		To a very great extent	To a great extent	Neither great nor small extent	To a small extent	To a very small extent
Q6014	First, think about people in your neighbourhood. Generally speaking, would you say that you can trust them…?	1	2	3	4	5
Q6015	Now, think about people whom you work with. Generally speaking, would you say that you can trust them …?	1	2	3	4	5
Q6016	And how about strangers? Generally speaking, would you say that you can trust them …?	1	2	3	4	5

Now we have a few questions about safety in the area where you live.

Q6017	In general, how safe from crime and violence do you feel when you are alone at home?	1 Completely safe 2 Very safe 3 Moderately safe 4 Slightly safe 5 Not safe at all
Q6018	How safe do you feel when walking down your street alone after dark?	1 Completely safe 2 Very safe 3 Moderately safe 4 Slightly safe 5 Not safe at all
Q6019	In the last 12 months, have you or anyone in your household been the victim of a violent crime, such as assault or mugging?	1 YES 2 NO

Last, we would like to know about your level of interest in local or national politics and your opinions about how the government responds to issues that interest you. Remember, all responses are confidential.

Q6020	How interested would you say you are in politics and national affairs? Would you say you are …..? *Read responses*	1 Very interested 2 Interested 3 Neither interested nor uninterested 4 Uninterested 5 Very uninterested
Q6021	Lots of people find it difficult to get out and vote. Did you vote in the last state/national/presidential election?	1 YES 2 NO 9 *REFUSAL*

Q6022	How much say do you have in getting the government to address issues that interest you?	1 Unlimited say 2 A lot of say 3 Some say 4 Little say 5 No say at all
Q6023	How free do you think you are to express yourself without fear of government reprisal?	1 Completely free 2 Very free 3 Moderately free 4 Slightly free 5 Not free at all

Time End ☐☐:☐☐

Section 7000: Subjective Well-Being and Quality of Life

Time Begin ☐☐:☐☐

Now, we'd like to ask for your thoughts about your life and life situation. We want to know how you feel about your health and quality of life.

Q7001	Do you have enough energy for everyday life?	1 Completely 2 Mostly 3 Moderately 4 A little 5 None at all
Q7002	Do you have enough money to meet your needs?	1 Completely 2 Mostly 3 Moderately 4 A little 5 None at all

Please tell us how satisfied you are with the following issues.

	How satisfied are you with…	VERY SATISFIED	SATISFIED	NEITHER SATISFIED NOR DISSATISFIED	DISSATISFIED	VERY DISSATISFIED
Q7003	… your health?	1	2	3	4	5
Q7004	… yourself?	1	2	3	4	5
Q7005	… your ability to perform your daily living activities?	1	2	3	4	5
Q7006	… your personal relationships?	1	2	3	4	5
Q7007	… the conditions of your living place?	1	2	3	4	5
Q7008	Taking all things together, how satisfied are you with your life as a whole these days?	1	2	3	4	5

Q7008a	How often have you felt that you were unable to control the important things in your life? *Read responses*	1 Never 2 Almost never 3 Sometimes 4 Fairly often 5 Very often
Q7008b	How often have you found that you could not cope with all the things that you had to do? *Read responses*	1 Never 2 Almost never 3 Sometimes 4 Fairly often 5 Very often
Q7009	How would you rate your overall quality of life? *Read responses*	1 Very Good 2 Good 3 Moderate 4 Bad 5 Very Bad 8 *DON'T KNOW*

APPENDIX II

Q4010-Q4017:

<u>Appendix A4.2</u>: Alcohol Card

Alcohol Use

1 standard drink =

1 standard bottle of **regular beer** (285ml)

1 single measure of **spirits** (30ml)

1medium size glass of **wine** (120ml)

1 measure of **aperitif** (60ml)

(note: net alcohol content of a *standard drink is* 8-13 g. of ethanol DEPENDING ON THE COUNTRY)

ALCOHOL EQUIVALENTS:

Wine:

1 GLASS OF WINE	1 Drink
1 BOTTLE OF WINE	6 Drinks
1 "WINE COOLER"	1 Drink

Beer:

1 BOTTLE OF BEER	1 Drink
1 CASE OF BEER	24 Drinks

Hard Liquor:

1 HIGHBALL OR SHORT GLASS	1 Drink
1/2 PINT OF LIQUOR	6 Drinks
1 PINT OF LIQUOR	12 Drinks
1 FIFTH OF LIQUOR	20 Drinks
1 QUART OF LIQUOR	24 Drinks